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EDITORIAL NOTES—GAS, &c.

Meeting of the Gaslight and Coke Company.

BREVITY and serenity were characteristics of the meeting of the Gaslight and Coke Company on Friday; and therein is the best evidence the Governor (Mr. Corbet Woodall) and his fellow-Directors could have of the thorough agreement of the proprietors with the lines of policy that have been adopted, and of their satisfaction with the results so far accrued. The policy that underlies action is a constructive one, involving the past, present, and future. There has been a great deal to undo and alter; and much to remove that was debilitating in the organization. The effect is found in the present, and the influence will be felt still more in the future. True, in one quarter of the immediate future, there is gloom. The several credits derived from the improved working and administration will have set against them a greater cost for raw material—a matter to which the Governor specially directed notice in the course of his address. The improvement in working, however, that has resulted from latter-day policy has put the Company in a stronger—a much stronger—position to face the stress of the current and threatened coal market conditions than they would have been in had things been (as they have been) otherwise. The position of the coal market is dealt with in another article; and it will be there seen with satisfaction that, while the Company dare not, in view of higher coal prices, contemplate at the present a reduction in the price of gas, still the Board have resolved that nothing short of absolute necessity will induce them to raise it.

The Governor's speech was explanatory of the many main points of the report and accounts upon which we commented last week; and, so far as they are concerned, there is really very little upon which to further remark. The proprietors had brought before them very forcibly the vast change that has come over the gas industry in its capital outlay, by the ever-widening bifurcation of internal and external capital needs. Of a capital expenditure of but a few hundreds short of £70,000, only a sum of a little over £4000 was spent otherwise than on meters, stoves, and distribution plant. This is a remarkable testimony to the unabated vitality of the prepayment meter system, the business from which, if not so profitable as some other branches in which the consumption per service is greater, has a wonderful effect in broadening the base of the gas industry. The importance of an extensive base requires no emphasizing in the pages of a paper dealing so largely with engineering topics. In connection with the fitting up of consumers' houses under the prepayment system, it was explained by the Governor how part of the increased expense under repair, maintenance, and renewals in the distribution department had been due to the final extinguishing of the suspense account to which it has been the custom to charge a proportion of the cost of pipes and fittings placed in consumers' houses. The relief thus obtained will enable the Company to follow in future the sound financial practice of charging depreciation in due proportion against each particular class of apparatus. It was an obligation upon the Directors that they should complete the rearrangement of the accounts in this single respect by the end of 1906. At the same time it is a proper step; for there is no part of a gas undertaking's effects that require such generous treatment in the matter of depreciation as the appliances that are to a large extent removed from direct supervision, and placed under the charge of more or less intelligent and careful consumers.

A matter that was hailed by the proprietors with intense satisfaction was the considerable continued advance of improvement in the carbonizing returns. The great saving in coal, coke, oil, and spirit, and other manufacturing expenses (upon which observation was made in dealing with the accounts last week), with at the same time an increased output of upwards of 116 million cubic feet of gas, is a matter of considerable significance. There has been a great overhauling of the carbonizing plant in recent times. Guided by technical counsel, uneconomical plant has been abandoned, reconstruction work has been going forward, and improved appliances have been adopted; and the Board have found that the money so spent yields a rich harvest. This work of renewing, in improved form, much of the most important of the functional parts of the works is not yet finished, and is going to be further pursued. But it is not from works alone that such a tangible accretion of profit has been derived. There has been a great reorganization in the details of working; and, may we not add, individual responsibility, under the changed *régime*, has been given greater and fairer play. The present success, though the weight of old clogs is still felt and must long be felt, is the refutation of past policy. The success is not (as has already been shown by us) alone represented, as an electrical contemporary seems to imagine is the case, in the 1·1 per cent. increase in consumption in the past half year. In regard to this increase, however, the half year embraced an exceptionally hot, bright, and long period of summer weather; and it was only towards the end that consumption promoting conditions prevailed. Nevertheless, the 1·1 per cent. is the equivalent in the case of this Company in the half year of a volume of gas measuring more than 116 million cubic feet. When this is considered, it is somewhat foolish to sneer at the inclusion of even the odd ·1. As to future business, everything is being done that is possible in ensuring good relations between the consumers and the Company. Great activity prevails in the department specially organized and officered for this work. The men receive technical instruction, lectures and demonstrations for consumers are frequent, and the Company's lady demonstrator and her assistants, in addition to paying visits to consumers' houses, find themselves in frequent request for advice.

There was one other point in the meeting; and that had reference to the amount of unaccounted-for gas. It was raised by a proprietor, whose engineering knowledge enabled him to fix upon a source of not inconsiderable responsibility. The Company's unaccounted-for gas is a shade only in excess of the average of the London Companies, and lower than in the majority of other undertakings. But, notwithstanding, there is no Gas Company whose distribution system is more exposed to disturbance than this one, on account of the great amount of subterranean work that has been, and is, proceeding in London. Tubes, trams, sewerage, and electricity and telephone works all contribute to the loosening and falling away of the soil below and at the sides of the pipes. The evidence given by Mr. G. F. L. Foulger before the Royal Commission on Motor Cars (reported in the "JOURNAL" for Aug. 21 last, p. 529) attaches interest and due importance to the point. That the unaccounted-for gas is not more than it is, attests the watchful supervision exercised in protecting both the public and the Company, under a condition of things that was not contemplated when the major part of the present gas canalization of London was constructed.

South Metropolitan Report and Accounts.

As usual, the report of the Directors of the South Metropolitan Company is no formal, prosaic document. It arrests attention. In its opening paragraph, it reminds us that the times have changed; and with the times the work of gas supply and the anxieties of gas administrators. Compared with some few years ago, the markets in which raw materials are bought and secondary products sold now vibrate more readily with external influences; and they require Directors to be ever on the alert. Municipal trading had not a few years ago attained the proportions of the present; and rates

were then moderate, and fairly uniform. Competition, too, was not so rife as it is to-day, and competition moreover that is largely carried on by the aid of the increased rates. The heavier demand for rates is bad enough for industry of any kind to bear; but for a gas company to have to shoulder the heavier rates, and to encounter competition supported by them, is putting a great strain upon human endurance. Combined with these disturbances to the gas business pursuing an even tenor, the industry has not yet emerged completely from the long period of transition through which it has been passing. The character of the business has been undergoing a vast change. More capital is now required outside the works for the business done; and the capital employed in the district has not the same earning capacity as before, though something approaching a balance is struck by what has been accomplished within the works. The average business per consumer, through the operation of the prepayment system, is smaller than formerly; and among the old consumers, the incandescent gas-burner has reduced the average of the accounts. It was only a year ago that Sir George Livesey was telling the proprietors of the South Metropolitan Company that inquiries had shown that 80 per cent. of the consumers were employing the incandescent mantle more or less; and among the accounts of those consumers who had partially adopted the mantle, it had been found that the consumption of gas was reduced, on an average, about 21 per cent. Until the 20 per cent. remainder of consumers, and the whole of the burners of the 80 per cent., have been converted to the scientific system of utilizing gas, the period of transition for this Company from one form of lighting business to another will not have been completed. And be it remarked, that the period of greatest activity in this consumption reducing change has been with gas at the very low price (for London) to private consumers of 2s. per 1000 cubic feet. In this connection, it is also noteworthy that the public lamps in the Company's district are rapidly approaching the end of their conversion to the incandescent system. The number of incandescent burnered street lamps is now 22,362; being an increase of 512 compared with the December half of 1905; and of the total of 23,128 lamps, only 766 are on the flat-flame system. Contrasting the same periods, there was a diminution in the gas consumption of the public lamps of nearly 10 million cubic feet, though the increase in the total number of lamps was 349.

Under such circumstances as those presented in the foregoing paragraph, it is surprising that the financial working results of the Company have kept as level as they have done over the past few years. Under the circumstances, too, a slight decrease in consumption is nothing to mourn over, in face of the ever-growing use of the incandescent mantle, and especially considering the conditions of the half year. The actual decline in private consumption was about 16 millions; and this was a decline from a total private consumption in the corresponding half of 1905 of 5,874,527,000 cubic feet. But when we look at the receipts for gas, the period of the half year during which diminution took place is seen. The receipts from gas used for private and industrial purposes in the Michaelmas quarter amounted to £229,204, which was a shortage, compared with the corresponding quarter of the December half of 1905, of £3111. As the receipts for privately consumed gas in the whole half year (£575,939) were only short by £2239 of the second half of 1905, it shows conclusively that it was during those abnormally hot and light weeks of the summer (when everybody desired to minimize as much as possible controllable sources of heat) that the loss on the half year arose, and that, in the second quarter of the half year, there was recovery of the loss of the preceding three months by nearly £1000. Despite the extraordinary atmospherical character of the half year—in great heat, short hours of darkness, and little cold until the close—with dearer coal, sluggish markets for tar and ammonia, and heavier rates (nearly £5000 more), one thing so balanced another that, in the final outcome, we have a small financial improvement on the second half of 1905. The balance of the revenue account (£191,226) is better by £3311; and the net deficiency on the amount required to pay a 5½ per cent. dividend is £15,313, compared with £16,616 in the second half of the previous year. In other words, the deficiency is less by £1300. In view of the difficulties and repeated deficiencies in profit, the Directors have shown a laudable persistency in maintaining the 2s. price; and the consumers ought to be very grateful to them. Prognostication as to the future maintenance of the price is impossible, in view of the serious menace of higher coal prices. About the additional demands of coal owners, the Directors have something to say in their report; and attention is drawn elsewhere in these columns to their advice that a united front should be presented by the gas industry to unreasonable prices. The gas industry will be curious to know what, in present circumstances, should be regarded as "reasonable" prices.

Compensating the deficiencies, in considering the general position of the Company, are several interesting features in the report and accounts. The connections of the Company continue to expand; and some £45,272 of additional capital has been required for mains, services, meters, and stoves. Some 14,400 more consumers (chiefly prepayment ones) have been added; 13,358 more cooking-stoves have been fixed; and gas-fires, gas-engines, and other industrial appliances for using gas have been supplied. Another indication of the expanding scope of business is found in the £3098 increase in the receipts from meters and stoves. It is in the extension of business, favourable markets, and economies, that financial improvement in industry has to be looked for. But in a business where economical working has been kept at a high pitch, and there has been strict regard for detail, there is not the same room for striking improvement. But there is the satisfaction that benefits have long been enjoyed. Nevertheless, though the expenditure for coal in this Company has increased by £23,684 (owing to higher cost), the consumption, by pushing improvement in working a little farther, was diminished by 8841 tons, while the output of gas was but a shade over 12 million cubic feet less than in the corresponding period of 1905. The higher level of yield per ton has consequently saved the Company a substantial additional expenditure on coal. Purification costs are again down by £4884; and carbonizing wages have been lessened by nearly £13,000. It must also be pointed out that, though £17,726 extra was obtained from coke, it was on a largely-reduced quantitative sale; and in considering the lessened revenue from tar, it will be observed that there was a smaller quantity used and sold. A further peculiarly pleasing feature about this Company, which serves to assist in maintaining the strength of its position, is the fact that of 14,804 proprietors, 12,382 are identified with the Company either as consumers or employees—8263 being consumers, and 4119 employees. The Company have a reserve fund of £178,396; a renewal fund of £25,333; and an insurance fund of £106,737. Inspected, therefore, from all points of view, the Company have great inherent strength to enable them to combat the drawbacks that will come upon them (as others) from external causes. The coal and tar markets, and the unduly high assessments, are the clouds. The assessments are under appeal; and Sir George Livesey and his co-Directors will not fail to severely contest the other threatened and present disadvantages.

Economy in Municipal Gas Production.

ALL too little consideration is given by our civic governors to the ultimate effects of the courses in policy that they pursue. We hear, in effervescent language, of what is being done to benefit the ratepayers in the present. But whereas the effects of the so-called benefits are often as transient as the language in which they are glorified, a different policy might result in more enduring and expanding advantage, by the promotion of the common prosperity. Prosperity begets prosperity, but only when it is properly nurtured. If it is left to take care of itself, there will be a gradual decline until, in all probability, there will be actual extinction. The degree of prosperity of industry depends largely upon the generous conditions of many necessary contributory services. Gas is one of those services. A cheap gas supply is largely instrumental in assisting industrial prosperity; and industrial prosperity brings affluence and comfort to communities. And the homelife of communities is made in its every part, even so to speak to its nooks and corners, the more tolerable by cheap service in this respect. There is vast and almost perplexing interfusion between all these things. But many municipalities ignore consequences in their passion for present show, for prosecuting extravagant schemes, and for securing a little volatile applause. Those who applaud do not think. Moreover, in giving play to their passion in this way, our modern local rulers often confer benefits upon those who have done nothing whatever to contribute to, or to deserve, them.

There was a function at Widnes on Tuesday last; and at

that function was Mr. Alderman Gibson, the Chairman of the Manchester Corporation Gas Committee. On the face of this, there is nothing peculiar; but the purely accidental combination of place and person sets one thinking of the question of the beneficiaries of economy in gas production when production is under municipal management, and the right and the wrong of their participation. Widnes furnishes the example of the benefits of economy in municipal gas production being utilized to serve the best and widest interests, and so to yield good to the greatest number. Manchester furnishes the example of a dearer gas supply; a proportion of the difference in price being due to a sum of about £1000 a week that is extracted from the pockets of the gas consumers—poor and rich alike—and scattered broadcast, benefiting in largest degree those who are not gas consumers, and therefore have not done anything, willingly or unwillingly, to contribute to the profits. Widnes itself was not always in the favourable position that it now occupies in regard to its gas supply. The antithesis of the present condition is found in the days before the advent of Mr. Isaac Carr as Engineer and Manager of the gas and water undertakings. Capital was then high per unit of output; and the price of gas was not at anything like the present inviting figures. Mr. Carr is an economist. The weak point of the gas undertaking was found upon his appointment; and countenanced by successive Committees, the process of whittling down capital per million cubic feet of production has been going on simultaneously with the improvement and extension of the works, in preference to the lavish making of profits, and their distribution among all and sundry, whether or not they have contributed to their making.

What is the result for Widnes? Through this growth from the patient prosecution of the set policy of the past, through favourable surroundings in regard to the procuring of raw material, through the prosperity of the industries that the service of cheap gas has helped to encourage, through the consequent day demand being equal to, sometimes in excess of, the night demand, and through the resulting (complying with the limitations of daily life and work) full-time employment of capital, gas is now being supplied in Widnes at 1s. 3d. and 1s. 1d. per 1000 cubic feet for ordinary purposes and 11d. for motive power, which last-named figure has even caused the borough's own commodity to be consumed for heating in moulding shops in preference to producer gas. These conditions that have fostered the cheapening of gas, and made the exceptionally low-priced supply available, would not have been created if over the past four-and-twenty years profits had been distributed in rate reductions, instead of being utilized in a manner that bestows the greatest possible benefit upon consumers in just proportion to their patronage. Where the price of gas is kept up for the purpose of obtaining profits for rate reductions, as in Manchester, the greater the patronage that a consumer gives to the gas undertaking, the more does he contribute to the sum that goes to relieve the rates of not only gas consumers but others—and wealthy people too—who do not subscribe a halfpenny to this fund, which therefore represents an unjustifiable inequality in taxation. In other words, the greater the patronage at ordinary prices, the greater the tax. At Widnes, the contrary state of things prevails; and gas is distributed at prices that advantage all who use it. Above all things, it encourages industries that give large employment; and such industries have helped to place the gas undertaking in the premier position in regard to low price. It is an effect of mutual interest and assistance. Municipal trading in any commodity can only be defended by the supplying of the community at the lowest possible paying price.

Therefore, at Widnes (we are dealing here solely with municipal and not company management), industry and the inhabitants generally are the beneficiaries of the economy that has produced the low prices. The more that economy actually produces reduction of price, the greater is the elasticity given to the gas business, and the greater the benefits bestowed. The Manchester gas undertaking has conferred benefits upon the gas consumers of all classes; and could it divest itself, as Alderman Gibson desires, of the encumbrance of a contribution of £1000 a week, or about £50,000 a year, to the reduction of the rates, still greater advantage would accrue to industry and to the consumers generally. The poorer class of consumers are actually paying 4d. per 1000 cubic feet more than there is any occasion for them to do. And part of this 4d. is going into the pockets of rich people who do not subscribe anything towards the making of the profits. There is something defective in a municipal trading system that permits of the infliction of such injustice; and it ought to produce a feeling of shame and revolt. Among the beneficiaries of the economy practised in the administration and technical operations at Manchester, are the electricity consumers, who do not contribute anything towards a reduction of the rates of the greater proportion of the population of Manchester who are gas consumers. Alderman Gibson is not the man to lack illustration to back his argument. He has listed the names of 21 electricity consumers in Manchester who do not consume gas at all; and yet the rates of these 21 electricity consumers are affected by the sum taken from the Gas Department to the extent of £1114 a year. We ask again, Where is the justice of such a condition of affairs in municipal trading? The Manchester gas undertaking has its elasticity diminished to the extent of the £50,000 a year or so taken from the consumers. Better by far allow both the gas and electricity undertakings to have full latitude, within paying bounds, in the competition one with the other; and then there must follow the development of advantageous effects, the distribution of which is directed, as at Widnes, by a law that has no association with injustice or with indirect or inequitable taxation.

There are just a few words to add, referring more particularly to the object of the function at Widnes. It was the inauguration of the, so far as we are aware, first four-lift holder erected on the Gadd and Mason system of spiral guiding. Mr. Carr has had the courage to go one lift higher than anyone else; and this is expressive of confidence in the invention. He had something to say upon the economy of this form of structure, and upon the low price, for a million cubic feet holder, at which the town had obtained this one. It works out to about £8 per 1000 cubic feet. The Corporation were, of course, fortunate in the time that the contract was placed. If they were giving out the contract now, in view of the enhanced prices of material and labour, the cost might be anything between 10s. and £1 more per 1000 cubic feet. Of course, the greater weight in a holder with guide-framing would cause the cost to be proportionately higher.

The Gas Coal Market.

THE outlook in the gas coal market is, at the moment, anything but conducive to the peace of mind of gas administrations; but there is reason for urging that panic-stricken negotiations should be avoided, as this would only strengthen the hands of the coal owners, and have a mischievous effect throughout the coal contract season. A similar warning was uttered by Sir George Livesey at the beginning of last year; and he then suggested, if he did not actually prophesy, that the comparatively small additional price the coal owners were at the time asking was only the beginning of greater demands, which might mean a return to the prices that ruled in 1900-1, if there was not cohesion in the gas industry in resisting the imposition. What was hinted might be, has very largely come to pass. Quotations are considerably higher than those at which contracts were entered into in the early part of last year; and there are ominous rumours as to what is going to be done to compel coal owners to draw a defined advance per ton from gas undertakings. Therefore, there is cause, as Mr. Corbet Woodall said at the meeting of the Gaslight and Coke Company last Friday, for some anxiety as to the cost of coal in 1907-8. "Prices," he added, "much in excess of those of last year have been "asked, and in some cases given, for new contracts; and "it is impossible to prophesy with any certainty what may "happen."

The northern coal owners were last year the greatest offenders in demanding and commanding increases in price for gas coal in excess of what was justified by the flux of prosperity in the iron and steel trades and the textile industries; and the Midland gas coal owners, to the chagrin of the Northern owners, secured some additional highly remunerative contracts that have not customarily passed into their hands. These recently won favours do not appear to have balanced judgment, or to have induced a policy that would enable the Midlands to secure and retain a larger share of the gas coal business than in the past. They are now, report has it, taking concerted action, to raise and maintain prices at the higher level at which quotations at present stand. But where there is concerted action in trade, it is rarely that it is so complete and sound that there are

not to be found owners who are in the position to, and will, sell below the prices of the combination. We have heard of coal that has been contracted for below present quotations, which are anything between 1s. 9d. and 2s. 6d. in advance of last year's prices; but, on the other hand, there are already instances of undertakings that, for one reason or another, have had to pay 3s. per ton upon the prices at which they—perhaps fortunately for them—made their purchases a year ago. There have also been certain corporations in the North who have been "feeling" the market; and at suggestions of 2s. increase, they have stayed their hands. Anyway, the prices that are now being quoted are bringing us perilously near the level of 1900-1, when in so many cases the gas consumers had to suffer an increase in the price of gas. We do hope, however (as Mr. Woodall remarked on Friday), that nothing short of absolute necessity will induce any augmentation of the prices of gas.

It cannot be denied that the conditions of trade have created an enormous demand for coal; and the removal of the 1s. per ton export duty has brought from abroad a considerable rush of orders. There is also the higher wages that the miners are now receiving, and their shortened hours. These factors constitute a situation that must inevitably produce a somewhat higher price for coal for gas manufacturing as well as other purposes. But it is a singular thing that the gas industry should always, among the coal buyers for industrial uses, be the seat of the highest pinnacle in prices during booms in trade prosperity, or when other incidental circumstances furnish excuses for inflating prices. Yet from no other industry do the colliery owners enjoy such regular and increasing demands; but their gratitude for this is curiously expressed. The conditions of the present have certainly hyperbolical representation in their views as to prices. Rumours have been started that the colliery owners are being in this matter largely coerced by the Miners' Federation, who threaten that, if owners are found underselling gas coal, those owners will have their men withdrawn. Another suggestion that has been in circulation, is one that we cannot think has been seriously conceived. It is that the extended and extending use of gas-stoves has the effect of reducing the rate of increase in household coal; and that the only way for coal owners and workers to get something additional out of the householder at these times, in respect of his greater use of gaseous fuel, is through the price of gas coal. But against the rumours as to pressure from the Miners' Federation, must be set the working combinations among the colliery owners. There will, of course, be as great a resistance as possible to the excessive grasping of the owners at the present time; and, among other things, carburetted water-gas plants will again be brought into full swing. In the report of the Directors of the South Metropolitan Gas Company, there is also a repetition of Sir George Livesey's suggestion of last year, that there should be united action in resisting the extortionate prices of the colliery owners. The report says: "Instead "of acting as isolated units, they [gas undertakings] should "act unitedly, and refuse to pay unreasonable prices such "as those given by the Copenhagen Corporation, who have "chosen the worst time of the year for making their con-"tracts." To present a united front, someone must make a move; and there should be conference over the matter by the heads of both Gas Companies and Gas Committees, to discuss what, if any, action can be taken. There is combination, conference, and agreement by the coal sellers; and why not on the part of buyers? Therefore, who will make the move for conference from the gas industry?

When dear fuel has done its work in oppressing the industries of the country, and colliery owners are eager to net the orders of the gas industry, their views as to what at this time constitutes a fair advance will receive, from buyers of gas coal, due consideration at the lower end of the scale of prices.

Disposal of Gas-Works Surpluses.

The familiar question of the relief of the rates by the transfer of profits from gas-works, has cropped up in an unusual fashion in two places within the past few days; and, curiously enough, in each case the trouble was of the same character—there was a desire to assist the rates out of the gas-works surpluses, which there was found to be some difficulty in satisfying. The more interesting discussion has occurred at Spalding, where the Local Government Board Auditor has brought the matter to a head by surcharging two members of the Urban District Council to the extent of £1000; these gentlemen having been guilty of signing a cheque by which this amount was transferred from the gas undertaking to the credit of the general district rate account. It will be seen from the reference to the matter which appears in another column that there are special circumstances affecting the question at Spalding; and although it is, of course, unlikely that the two councillors concerned will eventually suffer by reason of the surcharge that has been made, there may be some trouble involved before the matter is satisfactorily adjusted. It is reported that already application has been made to the Local Government Board, who have stated in reply that they see no reason to interfere with the exercise by their Auditor of his discretion. It will be noted that until lately the Board held that the profits from the works must be spent in improving the undertaking or reducing the price of gas; and in order to secure power to relieve the rates with any surpluses that might accrue, a Provisional Order was secured in 1903. In the following year, the Auditor allowed the application of £900 odd in aid of the rates; but on the next occasion, trouble arose, the Auditor having found that the Order contains a clause which, as he holds, prevents any part of the profit being appropriated to the rates so long as a "lighting rate" exists at all. The present lighting rate is 6d. in the pound; and whether it is extinguished or the district rate is reduced, seems to be largely a difference of account. The gas consumers do not appear to be concerned more than other ratepayers; for it is to be noted that the price of gas—2s. 6d. per 1000 cubic feet—is below the maximum figure at which the Order allows of profits being devoted to other purposes than a reduction of price. The second case is at Congleton, where the Town Council have sought (unsuccessfully) to obtain the Local Government Board's consent to the issue of a Provisional Order so amending the Corporation's existing Act and Order as to allow them to devote the surplus gas revenue to the borough fund or general district rate. The reply of the Board was that "a sufficient case had not been made out" for the Order.

An Omission from the Municipal Socialists' Programme.

"The Times" last Thursday contained the third of a series of articles on the work of the London County Council, and in the course of it the writer gave *in extenso* the programme adopted by the Council of the Metropolitan Radical Federation in 1891 and that of the Independent Labour Party which has been put forward as a manifesto in view of the coming Council election. The two programmes are on very much the same lines; but they differ in one particular which has a certain amount of interest for our readers. The programme of 1891 contained eighteen items, one of which was "to obtain powers to take over the plant, &c., of gas companies at a valuation." In the programme which is intended to influence the ratepayers next month these words are conspicuous by their absence; and the writer is curious to know why it is, seeing that it is proposed that the Council shall take over the docks, supply electricity, own all means of public locomotion, supervise and finance the hospitals, acquire dairy farms and mines, sell milk and coal, and "organize a system of central and local markets and slaughter-houses in conjunction with the Borough Councils." He answers his own query, and says it is simply because the workmen employed by the South Metropolitan Gas Company are shareholders in the concern, and consequently the proposal to deprive them of their property would be resented. Only those things which belong to somebody else are to be municipalized for the benefit of "Labour."

Electrified Photometry: The "Electrician's" Error.

On a succeeding page, we further discuss the section of the paper that Mr. C. C. Paterson read before the Institution of Electrical Engineers dealing with photometrical flame standards; and here we wish to correct a mistake on the part of our contemporary the "Electrician," which may lead to misapprehension. In the opening of his paper, Mr. Paterson alluded to the courtesy of the Institution of Gas Engineers in permitting the results of the tests on flame standards to be published in his paper for the first time. Mr. Paterson knew quite well that the acknowledgment he made was due. The "Electrician," however, is of contrary opinion. In an editorial paragraph, it says: "The 'JOURNAL OF GAS LIGHTING' seems to think that the courtesy was somewhat

misdirected, as some of the speakers in the discussion showed their contempt for flame standards. Although we do not agree with this point of view, we think it might be held that the permission to publish such results is altogether unnecessary, as they have been obtained by the application of public funds." The experiments were made for the Institution of Gas Engineers; and, in the accounts presented at the last annual meeting there appeared among the charges against the Special Purposes Fund, this item: "Standards of Light Experiments, £26 13s. 7d." We hope our contemporary will do the Institution of Gas Engineers the justice of giving equal prominence to correction that they have given to their mistake. In conjunction with this matter, the "Electrician" also thinks "that much might be gained by a greater exchange of courtesy between electrical engineers and gas engineers. There are many questions common to both industries;" and our contemporary sees "no reason why a joint meeting of the Institution of Electrical Engineers and the Institution of Gas Engineers should not occasionally be held."

Refractory Materials.

The best compliment that it is possible to pay to the reader of a paper at a technical meeting was accorded to Mr. A. N. Comely on Saturday by the members of the Midland Junior Gas Engineering Association—that is to say, his contribution was discussed at very great length. The subject of refractory materials may possibly not in the past have received the amount of attention which it deserves, in view of its importance to those engaged in the gas industry; but the Junior Associations, at any rate, seemed determined to do their share towards bringing it to the front—as witness the proceedings of the Scottish Association reported last week, and Mr. Comely's paper on "Refractory Materials used in Gas-Works," an account of which appears to-day. The preparation of a paper must always involve considerable expenditure of time and trouble; but this, of course, only adds to the credit which is due to those who undertake the task. But if the effort is great, it is—as, indeed, is the case with all well-directed effort—not without its reward; for the amount of research involved, particularly in connection with so complex a question as the one under consideration, must be of benefit to the author of the paper as well as to his fellow-members. Mr. Comely has proved himself quite capable of tackling a difficult subject; and the Association have shown themselves no less able to discuss it in a thorough and a very interesting manner. The paper, of course, dealt largely with facts; but at the same time there were in it points which afforded plenty of scope for argument. For instance, there was the question of the standardization of retorts, which met with a considerable amount of attention at the hands of the members; and another matter on which considerable difference of opinion was manifested was the suitability or otherwise for use in gas-works of Ewell bricks. In all probability the members of the Association will shortly have an opportunity for still further priming themselves on the subject of fire-clay, for they have been invited to pay a visit to the works of Messrs. George K. Harrison, Limited, at Stourbridge, where they will be able to see the process of manufacture and inspect the firm's mines and the various seams of fire-clay.

Manchester District Institution of Gas Engineers.—We learn from the Hon. Secretary (Mr. H. Kendrick, of Stretford) that the next quarterly meeting of the Institution has been fixed for Saturday, the 23rd inst., in Manchester. The programme will include—in addition to the ordinary business of the annual meeting—the address of the President (Mr. W. Prince, of Stoke-on-Trent), the completion of the discussion on Mr. George Stevenson's paper entitled "Experiences in Competition for Power," and the discussion of Mr. Edward Allen's paper on "High *v.* Low Grade Gas."

"Transactions" of the Institution of Gas Engineers.—We have received the volume of proceedings of the above-named Institution for the past year. In addition to the papers read at the annual meeting held in June, under the presidency of Mr. Charles Wood, of Bradford (whose portrait, as is now customary, forms a frontispiece to the book), with reports of the discussions thereon, and the other matter usually included in the volume, there is a translation of the report of the transactions and of the minutes of the proceedings at the first session of the International Committee on Photometry, held at Zurich in June, 1903, which were published under the supervision of the Société Technique du Gaz en France. This important appendix to the "Transactions" is followed by a series of abstracts of papers which appeared in chemical and other publications—mostly the "JOURNAL"—during the year.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 361.)

BUSINESS on the Stock Exchange was again very quiet all last week. Anxious regards were still being directed towards the cyclonic centre across the Atlantic; and the prevailing disposition of the doubting mind was to pursue a policy of masterly inactivity. At the opening, the tendency was tolerably fair; but this gave way in many lines. It was account week; and there was some hope that the settlement might be satisfactorily adjusted. As a matter of fact, two minor failures were reported. After this, things fell very dull; and the week closed with marked flatness in commanding markets—as Home Rails and Americans. In the Money Market, there was a good demand for Stock Exchange and month-end purposes, and rates were firm; easing off afterwards when requirements were satisfied. Discount was firmest at the close. Business in the Gas Market was fairly well up to the mark, though perhaps scarcely quite as active as in the preceding week. Movements were irregular; and changes of quotation were about as many in one direction as in the other. But the most sensational move was a sharp and sudden fall in Gaslight and Coke ordinary. This stock had been standing very well in the market—promoted by the Directors' announcement of the dividend and carry-forward, and confirmed by the half-year's accounts. The quotation had advanced well above par, and dealings as high as 101⅛ had been marked, when, quite suddenly, on Thursday, the quotation fell two points. This was followed next day by a fall of one more—stock changing hands more than once at 98. The explanation of this phenomenon appears to be that the market took fright at the rise in the price of coal. Coal is no doubt higher, and probably will not be lower yet awhile; but "panicky" movements are always regrettable. There were moderate dealings in the secured issues; the preference being done at from 108 to 109½, and the debenture at from 85 to 86. South Metropolitan was a little less active, but firm—transactions being between 128 and 129. The debenture was done at 84½ and 85. Rather more business was apparent in Commercials. The 4 per cent. changed hands at 112½, the 3½ per cent. at from 108½ to 110 (a rise of 1 in the quotation), and the debenture at 83¾. Not much was marked in the Suburban and Provincial group; but both Alliance and Dublins and West Ham preference had a rise. Brentford new was done at 204½, Brighton original at 236, British at 42¼, South Suburban preference at 125, Hastings 3½ per cent. at par, and ditto 5 per cent. at 120½. In the Continental Companies, Imperial advanced a point, with dealings at from 182½ to 184, and ditto debenture from 96½ to 97. Union marked from 125½ to 127; and European fully-paid 24⅞ *cum div.* Among the undertakings of the remoter world, Bombay new was done at 5⅛ and 5¼, Buenos Ayres at 11⅝ and 11¾, Cape Town debenture stock at 97¼, Monte Video at 12, Primitiva at from 7 15/16 to 8 3/32, ditto preference at 5 7/16 *cum div.*, and 5 5/16 and 5 11/32 *ex div.*, and River Plate debenture at 96¼ and 97.

The closing prices are shown in our list on p. 361.

ELECTRIC LIGHTING MEMORANDA.

A Big Opposition to the L.C.C. Bill—Cheaper Electricity an Assumption: Heavier Rates a Certainty—The Wiring and Fitting Powers of the London Borough Councils—Municipalities and the Local Government Board—Cost of Cooking by Electricity.

WHO are up in arms against the London County Council electricity scheme? The question involves an answer that would occupy too much of our space; and so its opposite had better be put, and the inquiry made, Who are not up in arms against the London County Council scheme? The reply is, only those whose party names—Progressives and Socialists—are at the present time somewhat repugnant to the majority of London ratepayers; and of the Progressives, it is the large irresponsible section whose personal views on this momentous question would be of very little account, if it were not that they just now command the situation by numbers rather than by mental capacity. The County Council have this last week confirmed their resolution to proceed with the Bill; but there is an intelligent minority in the Council who are praying in most fervent spirit that the Council elections in March will see such a change in the dominant party that London will not be committed to the fearful rashness now contemplated at Spring Gardens, and encouraged by the Government. With that encouragement, the Progressive and Socialist majority of the Council do not care much for all the outside opposition that can be brought against their remarkable scheme. The only really effectual way of preventing the threatened great harm to London will be by the crushing out next month, by the ratepayers, of the present majority on the Council. Such an act would be hailed with the greatest satisfaction almost everywhere where prudence exists. Meanwhile, the Metropolitan borough councils, the outside local authorities, ratepayers' associations, companies, and trade organizations are preparing themselves for serious opposition if the Bill does go forward. The immense financial responsibility that this County Council monopoly scheme would involve is recognized as a real peril on all sides; and the inanities that have been poured from platforms recently as to electricity being

the one great thing needed to stimulate industrial life in London, have not succeeded in dissipating fear.

The idea that the manufacturing industries of London are craving for electricity is as much an assumption as is the whole of the rest of the case that is put forward by the London County Council in this regard. The present suppliers by organizing their forces can do all that is required, without bringing greater burdens upon the ratepayers. The Finance Committee of the County Council and even the propounders of the scheme fully admit that there must be a charge on the rates for many years. Excessive rates have made London uninhabitable by some considerable representatives of industry; and yet here we have the County Council submitting to the manufacturers a proposition—without taking the trouble to find out how far their assumptions as to power business are well-founded—that might have emanated from a lunatic asylum. "We are proposing," the Council submit in effect, "to supply manufacturers with electricity (if they will have it) at, we fancy, a cheaper rate than they can get it for now; but in order that we may see whether or not we can do this, we intend spending many many millions of money, propose to acquire the existing undertakings, and shall have to add something more on to the rates." That is the bare proposition. And we may be permitted the opinion that if cheaper electricity (ignoring for the moment the assumption as to cheapness) is to result in heavier rates, the manufacturer would rather be without the cheaper electricity. Cheapness of supply is only one thing the manufacturer has to consider. Heavier rates, constancy of supply, the cost of tearing out existing motive power plant and replacing by electric motors, and the competition of ordinary distributed gas, and of suction gas plant, must all come into the reckoning. The County Council are imagining a vain thing if they harbour any belief in such a scheme as they have in contemplation sweeping before it all other forms of motive power. Now, there are electricity undertakings in parts of London doing special business in electricity for power purposes at a cheaper rate than the County Council are proposing, and yet they cannot succeed in capturing the motive power business. In brief, in the hands of the Council, the scheme is one for creating heavier rates, for making London still further uninviting for industry, for retarding electrical progress, and for producing an instance of an enormous commercial failure. If the Bill proceeds, and there is a fair field and no favour given to the combatants, there will be a grand fight over it. But in the present Parliament, we fear, after the experiences of last year, as to the fair-field-and-no-favour part of the essentials to a grand fight. It is noticed that the Bill is to be handled by the friendly Commons at the outset. The Council would hardly care to risk the Lords until the Lower House has done all they can to strengthen the Council's position.

Certain of the Metropolitan Borough Councils are taking steps to put into force the wiring and fittings powers given them under the London County Council (General Powers) Act of last session. In the case of Southwark, it is thought advisable that the number of lamps wired "free" should be limited to six, that slot meters should be used, and that the standard rate of 4d. per unit should be charged, to include lamp renewals, excepting breakages due to carelessness. As an alternative, hire purchase is suggested. The Stepney Borough Council are also moving. Ratepayers, especially the large ones, will not forget that this wiring and fitting business is to be done on a paying basis, and that separate accounts are to be kept. These accounts will need to be carefully scrutinized to see that the charges made actually meet expenditure. Attached to the report before us referring to Stepney, incidental mention is made of the fact that one large consumer has intimated that, unless the Council take some steps to carry out such alterations to his installation as will effect considerable economy in the consumption of energy, he will have no alternative but to cease taking a supply from the Council.

Municipal electrical engineers are feeling very sore over the depth of interest that the Local Government Board now take in the affairs of their undertakings when applications are made for additional loans. The depth of interest is very embarrassing and inconvenient; and it would be more in consonance with the views of the engineers if the Inspectors of the Board would conduct their examinations in a more superficial manner. Instead of feeling sore, there ought to be gratitude; for the sole object of the Board is to place municipal electrical finances on a perfectly sound basis, and above suspicion. It is not the fault of the Board that a more rigorous supervision on their part has been called for. There have in the past been some pretty severe strictures by the "Electrical Times" in regard to the muddled finance that has been disclosed in certain east-end boroughs, at Brighton, and elsewhere; and lately in the same quarter there has been a series of articles in which the Board and their Inspectors are railed at in most luxuriant style in respect of their searching and most uncomfortable investigations. Those very investigations are the ones that have brought to light disgraceful conditions of affairs that are not creditable; and, therefore, instead of reproach there should be praise. Civic life does not begin and end in a municipal electric-light undertaking. There are the ratepayers to be considered, the greater proportion of whom are not users of electricity. The paramount duty of the Local Government Board is the protection of the ratepayers by exercising the control and regulating powers that Parliament has conferred upon the central authority. The gravamen of the charge against the Board is that they are too diligent in unravelling mysteries and making plain and straight the rough places in municipal finance. But they cannot be accused of exceeding their powers. The Board's well-meant advice, that local authorities should practise more economy in public lighting, is also keenly resented in a lengthy diatribe. The new proposition is advanced that, if a gas company can do the public lighting for £1200, and it cost £2000 by electricity, the profit that is derived from the latter merely goes from one municipal pocket into another, so that the ratepayers really have no ground for complaint. Those ratepayers who are not electricity consumers, but are patrons of the gas company—and who know that the company under the sliding-scale of price and dividend cannot get an increase in the latter unless they distribute among the consumers in the shape of a reduction in price about seven times more than the amount required for the extra dividend—will hardly see the force of the contention; for they will have to bear their share of the extra cost of £800, and get no benefit from it. If all the ratepayers were electricity consumers, there might be a little more reasonableness in the proposition, but not much, seeing that, although electricity causes the total cost of public lighting to go up by leaps and bounds, the electricity department cut the charge they make as fine as possible—in some cases the lighting is actually done below cost, to the detriment of either the private electricity consumers or the ratepayers—in order to get the lighting from the hated rival. In the economics of municipal expenditure, £800 less taken from the pockets of the ratepayers is a not inconsiderable saving. It is a roundabout way of getting an additional £800, to take it from the ratepayers for public lighting (if an amount £800 less would suffice and be remunerative), put it to the credit of the electricity undertaking, and then have it transferred to the public exchequer, to help to assist in ministering to the rampant excesses in municipal administration in the present day. The argument of our contemporary has not the merit of strength.

There are very few reliable statistics published regarding the cost of cooking and heating by electricity. Those that have been made public are generally nothing more than manufacturers' estimates, which, like carbon filament lamp ratings, decline to be confirmed in practice. In the year 1897, Professor Jackson, of Pennsylvania State College, showed that cooking by electricity cost about five times as much as cooking by gas. Since 1897, the prices of both gas and electricity have been reduced considerably, and electricity has also been given, for these purposes, the advantage of a differential price, in order to secure for electricity stations an additional source from which to fill up the valleys in the load curve. But up to the present time, the contributions of cooking and heating are not overwhelming the station engineer. Still the cost has come down, as is brought out in an article by Charlotte D. Seaver, B.Sc., published in the "Clarkson Bulletin." The article is really a record of results attained in a series of experiments in electrical heating and cooking as conducted in the Home Economics Laboratory of the Thomas S. Clarkson Memorial School. Though these results were under American conditions, the character of the information accords to it a value for those interested in the question. In the experiments, similar articles of food were cooked in electricity, coal, gas, gasoline, and kerosene ranges; the fuel in each case being weighed and measured. The cost of electricity was on the basis of 2d. per kilowatt-hour, coal 28s. per ton, gas 4s. per 1000 cubic feet, gasoline 7½d. per gallon, and kerosene 7d. per gallon. Between 2s. and 3s. would be the price of gas in most towns in this country, and in a few below 2s.; so that allowance must be made for this great difference in price. At the same time, it must not be forgotten that in many places in this country electricity is now being sold for cooking at a price—frequently 1d. per unit—that really cannot pay for such a small intermittent service. However, in these experiments—with the buying prices as named for the fuels, in the same kind and character of cooking operation, the time in each case being based on one hour—the relative costs were: Electricity, 2·064d.; coal, 1·83d.; gas, 1d.; gasoline, 0·6d.; kerosene, 0·55d. So that it is seen that electricity was the dearest of all the fuels. Besides, in the experiments, there was exercised the utmost care in using electricity—such care as it could not be expected would be observed in the kitchen, or if expected there would be disappointment. Our informant in her statement says that, when baking, the current was turned on from 20 to 30 minutes before the articles to be baked were placed in the oven, so as to allow for thorough heating, and it was turned off again 10 minutes before the baking was done, as the oven would remain hot long enough to complete the operation. Time is a consideration in cooking; and using electricity for this purpose, a large amount of time appears to be absorbed compared with the gas-oven. For example, in the baking of four apple pies, only 7 inches in diameter, the time required to raise the oven from cold to effective cooking temperature was 25 minutes, and the operation itself took 35 minutes, so that an hour was expended in cooking these four *petite* pies. In the reprint of the article in the "Electrician" (we do not know whether the figures were given in the original print), no mention is made of the time occupied for the same operation with gas. The conclusion of the writer is that cooking by electricity costs, on the prices quoted, double the amount that gas would do; and that this fact, together with the initial cost of the cooking apparatus, "would appear to forestall its general adoption at present." The points as to time, reliability, and repair have also to be taken into account; for there has to be considered not only the bare cost of the electricity to the householder, but the ruffling of tempers through disappointment, the continuity of service, and the "extras."

THE PHOTOMETRIC ELECTRICIAN.

We ventured last week (*ante* p. 266), when discussing Mr. C. C. Paterson's investigations on the influence of atmospheric conditions on the value of flame standards, to question the propriety of delegating such research work to an electrician, on the ground that it involves, for its proper execution, chemical analyses of a precise and special nature, to make which one who is primarily an electrician would scarcely be competent. Moreover, we indicated that, whether for the foregoing or for some other reason, Mr. Paterson's investigations were decidedly unsatisfactory in so far as they related to the influence of atmospheric conditions. Naturally he is more trustworthy in his study of electrical standards of light; but before they are discussed, his methods of photometry may appropriately be referred to, especially as it would seem that they are, in some measure at least, responsible for the dislike Mr. Paterson and his electrical *confrères* obviously show to flame standards of light.

Mr. Paterson has used a bar photometer, equipped with the Lummer-Brodhun head, in his studies of flame standards. He does not directly compare one lamp with another, but each in turn with one of the large bulb electrical standards which, he says, now form the principal working standards of the National Physical Laboratory. If the flame standard under comparison is, for instance, a Harcourt lamp, he sets it up vertically at one end of the photometer bench, lights it and throws open all doors and windows of the room, and allows it to burn for half-an-hour under these conditions. The electric comparison lamp is then brought to its proper voltage, and all doors and windows are closed. Some twelve or fourteen readings are made during the first ten minutes after the room has been closed. As regards the accuracy of photometric observations under these conditions, Mr. Paterson says that much depends upon the condition of sensitiveness of the observer's eye on any particular occasion.

It would be difficult to frame a more damaging indictment of the photometrical work—so far as flame standards at least are concerned—conducted at the National Physical Laboratory, than these naive confessions of Mr. Paterson. The photometer-room is clearly devoid of adequate ventilating arrangements; and consequently comparisons are limited to a period of ten minutes immediately following half-an-hour's exposure to the external atmospheric conditions. On one occasion the observer's eyes will have been dazzled immediately before by brilliant sunshine without; on another, he will shiver in the frosty air so freely admitted; and on a third, he and the apparatus will be bedewed by the deposition of moisture from a saturated atmosphere. Bedazzled, benumbed, or bedewed, he will certainly not be physically capable of making accurate photometric observations within ten minutes. Moreover, upwards of an hour will elapse before a second flame standard can be tested under these arrangements; and appreciable changes in atmospheric conditions may clearly occur within this period. The Lummer-Brodhun photometer head again is a very clever optical device; but it is complex, and the opinion of many observers is that it is less sensitive than other and simpler arrangements. Mr. Paterson would find the report of the Dutch Photometry Committee of 1893 instructive in this connection.

The Harcourt lamp is tolerably capable of withstanding rough usage; but we doubt if it will remain unaffected under repeated half-hourly exposures to the winds and dews of heaven. Open-air treatment is likely to prove prejudicial rather than beneficial to it. Mr. Paterson, however, in addition to this drastic procedure, regulates the air supply to the pentane saturator by a novel method, which may conceivably modify the value of the standard. He affixes a piece of india-rubber tube to the air-inlet cock, and regulates the flow of air through it by an ordinary screw clip. We are not told the length of the piece of tube; but if it is short, the regulation must be effected with the observer in close proximity to the lamp, if long, the tube must appreciably alter the "pull" of the air-gas syphon. In the latter case, the air is drawn from another part of the room, and the effect of variations in the composition of the atmosphere could not then be satisfactorily observed. The Harcourt lamp is used in gas photometry with other means of regulation; and Mr. Paterson does not say why it is he has discarded these in favour of his own device.

This brings us to our main objection to Mr. Paterson's work on this lamp—viz., that it has not been carried out when the lamp has been burning under normal conditions. If the National Physical Laboratory desires to adopt this flame standard for the rating of secondary standards, it should use it under the conditions in which it has been used for gas testing in the Metropolis since 1898, and in many other towns for a shorter period. These conditions are well known; but Mr. Paterson's paper leaves it more than doubtful whether he has conformed to the following among others: Use in a properly warmed and ventilated room, with the burner at a particular height above a table-surface, and not less than a certain distance from any wall of the room, and with the height of the flame regulated by the outlet cock of the saturator, or the conical damper on the inlet-cock. We are not arguing that these are ideal conditions; but they are those under which the lamp was originally, and is now, used as a standard of light, and any departure from them may result in an alteration of the value of the standard. We do not gather that the Institution of Gas Engineers desired Mr. Paterson to modify the Harcourt standard, or to give it a new value; but his paper raises grave doubt as to whether he may not have unwittingly, by altered conditions of use, have wrested it from its original standard value. In that event, the value of the secondary electric standards which "now form the principal working standards of the National Physical Laboratory" seems more dubious than ever.

PREPAYMENT PROTECTION.

Effect of a Strong Money-Box.

The law relating to the ownership of money deposited by consumers in the boxes of prepayment meters is in a very unsettled state; and until the matter is decided beyond further dispute, no one can positively say whether the money in a prepayment meter box is in the custody of the consumer or of the gas company or corporation gas committee to whom the meter belongs. Only recently, in Metropolitan Police Courts, there have been decisions, and expressions of opinion on the point from the Bench, that are diametrically opposed. Notwithstanding that a prepayment meter agreement of the Gaslight and Coke Company says that "a consumer shall be accountable to the Company until the money shall have been collected by the Company's officers," and that if "from any cause" the amount of money in a prepayment meter-box is found to be less than the sum which ought to have been there, &c., Mr. Biron, at the Old Street Police Court, declines—where a meter has been robbed, and it is not proved that the consumer himself has committed the wrong—to make the consumer responsible for the stolen money. In another case at Highgate, where a consumer had left a house without giving the North Middlesex Gas Company notice, and the prepayment meter-box had been forced and rifled (although there was no actual decision in this case), the Chairman of the Bench expressed very similar views to those to which Mr. Biron gave utterance a few days later. The Chairman in the North Middlesex case, pointed out that the prepayment consumer had to pay for his gas before it was used; and the Company would not let him have gas until it was prepaid. The meter, he also contended, was not the consumer's, and the Company locked the money-box up, and so took all control out of the hands of the consumer.

Now the decision and the expression of opinion here referred to open up a vista of enormous unpleasantness, trouble, and risk on the part of gas suppliers; while, at the same time, there is much to be said from the consumer's point of view in favour of the cited opinions. If these opinions are maintainable in law—despite agreements that, *primâ facie*, one would have formerly imagined left no loophole for escape from responsibility on the part of the consumer—then wherever there is a robbery of a meter, the gas suppliers will have to discover the perpetrator before they can have any possible redress. Moreover, such a condition of affairs would, it is to be feared, lead to an increase of plundering on the part of unscrupulous consumers, who would evade any responsibility by merely declaring that the robbery was the work of some unknown person. Discovery and onus of proof would, under such circumstances, rest with the gas suppliers. For them the position of this question is indeed a serious one.

On the other hand, there is something to be said for the prepayment consumers. Because such consumers are, as a rule, poor, they must not therefore all be treated as suspects. But being poor, in some cases, temptation is strong when poverty pinches. That is another side of the question; we are now on the point as to the ownership of the money in the box of the gas-meter. Looked at from the consumer's point of view, he has no property in the meter. The pence pass from his possession into something that is the property of the gas supplier. The company "protects" the money, after a fashion, by lock and key, and sometimes seals, as against the consumer. The consumer is in no way consulted as to the security afforded by the meter. The gas supplier alone has the determining voice as to what constitutes sufficient security; and the judgment of the gas supplier, the gas supplier holds, is sufficiently good to be binding on the consumer. But what does the very title of "prepayment" system signify? There can be no *pre*payment unless there is a transference from the possession of one person to another of the consideration for value to be received prior to its being received. The gas supplier, however, tells the consumer that possession of the money still rests with him; but the gas supplier puts a lock and key between the consumer and the money, and retains the key. Assertion and act are in such a case most difficult of reconciliation. The gas supplier, however, points out that he offers the gas consumers who so desire, certain special facilities on specified conditions; and if, by one of those conditions a consumer agrees to be responsible for the money in the box of the meter until removed by the collector, or until the consumer gives notice of his intention to quit the premises supplied, then such an agreement, even in the event of robbery, it would appear, ought to be upheld by law, although, in many cases, it would involve great hardship on those who buy gas by the pennyworth. Therefore, until it is properly placed beyond further legal contention, the question of ownership of, and responsibility for, the money in prepayment meters will remain a knotty and uncertain one.

Meantime, the subject is worth consideration from other important sides. The extensive use of the prepayment meter has proved two things, in addition to convenience and profitableness—that its existence is another temptation to frail humanity, and

that the resistant power of the money-box, as usually constructed, is practically at an irreducible point. The former directs the train of thought into considerations of ethical importance, and the latter as to whether gas suppliers are doing all they ought to do in protecting themselves and their consumers against temptation and against others breaking into houses for the sole purpose of plundering the accessible money-boxes of their prepayment meters. There seems to be little consideration as to moral obligations, though it has been said in a Law Court that prepayment gas-meters manufacture thieves. The gas supplier courts prepayment; but for security in most exposed places, he trusts to honesty and to an unsubstantial sheath for the deposited money. Reliance on such protection shows a generous belief in human nature.

A short time since, in conversation with Mr. Alfred Colson, of Leicester, he was very emphatic upon the point as to the moral obligations of gas suppliers in this regard; and he urged that they have no right to expose their poorer customers to temptation, nor to make their houses a mark for the house and meter breaker, who laughs at padlocks and paper seals while the money-box will readily yield up its contents by a little more or less gentle persuasion with almost any hand tool. Inquiry shows that it is this recognition of moral responsibility that has mainly caused the Leicester Corporation Gas Committee to adopt largely the strong, resisting money-box that has been designed by Mr. Colson for the purpose of protection—for the protection of the consumer as much as of the property of the Committee, and for the removal of tempting conditions as much as for the purpose of saving deposited money. The experience is that the new box has done all that was expected in these respects, and a great deal more. It relieves many of responsibility, and places more upon the money-box. Before leaving this question of moral responsibility, there is an interesting suggestion that may assist in driving the matter home. Mr. Colson, when he was considering the matter, kept, throughout one quarter, a map, upon which he placed a red dot for every meter that was violently pillaged. At the end of a quarter the map as we saw it looked much as though there had been a frightful epidemic in the district. If other gas engineers in populous districts would do the same, it would convey to the mind more than the daily knowledge of these occurrences, which are treated merely as passing incidents of the new form of business. Inspecting such a thickly dotted map, the question arises, Why is it that every one of the dots should represent a thief? The only answer can be that the prepayment meter money-box in its common form of construction, invites and readily lends itself to attack and robbery. And for that form of construction someone is responsible.

This being so, it is the money-box that needs attention; and it is a money-box designed by Mr. Colson that has had a splendid moral effect in Leicester. The box is a patent one; but the experience with it in Leicester to which we are about to direct attention has not been obtained by the enrichment of Mr. Colson by a single penny piece. It is only due to Mr. Colson to mention this, as he has been good enough to comply with a little solicitation that he should give, through the "JOURNAL," of his experience in this connection for the benefit of the gas industry. But before dealing with that experience, a few words describing the money-box are required.*

The box really consists of two parts—an outer casing of malleable iron, and an inner receptacle for the coins, made of tinned plate or sheeting. The upper part of the outer casing is further strengthened by inside ribs. The bottom of the outer casing is closed by a strong detachable piece which slides into recesses—being caught at one end by a lip on the outer casing, and fastened at the other end by a patent lock that Mr. Colson has adopted after trying several other patterns. This bottom closing piece is quite invisible to the eye, unless the meter is placed at such a height that the keyhole is discernible. This is an important point in the protecting influence of the box. The inner receptacle is held in position by the inner ledge at the bottom of the outer casing; and it is noteworty how dexterous the collectors get in manipulating the cover in its bottom position, and in dislodging and replacing the coin-box. The arrangement is adaptable to any type of prepayment meter; and, in fact, all makers of meters now supply it. In most instances, the box is affixed to the meter by bolts and nuts, with a stiffening piece inside the meter; and, in addition, there is a lip (or some other device) protruding from the money-box on to the face of the meter, so as to prevent anyone using an instrument in the attempt to forcibly disconnect the box from the meter. It is clear that a meter would have to be practically destroyed before the money-box could be detached. The reward is too speculative for so much trouble to be taken—even by a thief.

That is, in general terms, a description of the patent money-box which Leicester has found to be so beneficial. Now as to the results of the application of the new arrangement—to, at present, selected parts of the town and to doubtful cases. The following figures will show by comparison what an effect the box has had in diminishing thefts; and where there have been thefts recently, the thieves do not visit the same place a second time, knowing that they will meet with their new and invincible enemy.

The figures as they stand are eloquent in their lessons; but there are a few explanatory remarks to be made concerning them. It will, in the first place, be noticed that up to December last,

* An abstract of the patent specification appeared in the "JOURNAL" for Oct. 23 last, p. 251.

Prepayment Meter Thefts Before and After the Partial Adoption of the New Money-Box.

Quarter.	Cases.	Amount. £ s. d.	No. of Patent Cash-Boxes Fixed.
1905. July, Aug., Sept. . . .	306	51 11 2	0
,, Oct., Nov., Dec. . . .	288	48 14 9	0
1906. Jan., Feb., March . . .	270	51 11 6	0
,, April, May, June . . .	153	25 19 0	281
,, July, Aug., Sept. . . .	133	24 3 7	754
,, Oct., Nov., Dec. . . .	137	22 5 2	1575

Four weeks, January, 1906, £16 6s. 4d., 92 cases.
,, January, 1907, £6 8s. 9d., 42 cases.

1575 new boxes had been fixed. These are out of a total of upwards of 30,000 prepayment meters that are in use in the borough; and, as explained already, they have been fixed in selected places. When this is considered, it will be admitted to be an important point, as the reduced cases of robbery show the wisdom of the selection made. It is not proposed, until renewal or necessary repair gives the opportunity, to make any special provision for replacing the old form of boxes by the new where coin meters are fixed in the houses of a respectable class of consumer. In some streets there are never any robberies; in others, they are frequent. There have been nineteen cases (four empty houses included) where thieves have attempted to break open the new form of box, without success, save in two early cases where the meters were fitted with the original pattern of brass box with large top opening. But there has been no success with the later iron pattern boxes. It is believed that this has had an influence in impressing the plunderers that there are more of these boxes in use than there really are, and also that, when the boxes are recognized, the would-be riflers prefer not to waste their time fruitlessly, and so leave them alone.

Now as to the additional cost. This is a matter, if regarded from the standpoint of the moral duty imposed to make prepayment cash-boxes as strong as reasonableness will permit, that ought hardly to be considered. The whole cost of the stronger box, including lock, only amounts to about 3s. 6d. per meter in excess of the price of the old form of meter. The point is made as to the figure including lock, because special padlocks are, as a rule, an extra with the old type of money-box. Furthermore, the new box is practically indestructible, and will outspan in life several ordinary type boxes. Take the estimated life of a box constructed as this one is, and divide the cost by the number of years, and the cost per annum would be found to be infinitesimal. To the credit of the new box too has also to be set the reduced trouble, anxiety, and expense in repair caused by robberies. On the whole, the additional expense appears to be a small one to get, as opportunity serves, the extra security; and there is opportunity with every new fixture.

The police, as remarked, are particularly satisfied with the use of the new boxes. The introduction of the prepayment meter and its safe keeping have placed further responsibility upon them, and they have already found the application of the box in the selected quarters of Leicester a very great relief; and that relief causes them to wish for the hastening of the day when Leicester will know the old fragile money-box no more. The meter makers, too, have all taken up the patent box, and speak of it in high terms of approval—characterizing it as the best step that has been yet taken in curing the all too frequent robberies of prepaid gas moneys. Mr. Colson's staff are likewise equally confident of the security it affords. Imprisonment does not lessen the number of robberies under ordinary conditions. As a matter of fact, the advertisement the example of wrong-doing gets by prosecution instead of acting as a deterrent offers suggestion to others on the look-out for means of surreptitiously adding to their incomes. In the one or two attempts that have been made to plunder the patent boxes, the would-be thieves have, as already stated, met with no success. Where the habitual thieves know the patent box exists, they will not go. This shows the relative influence of a strong and a weak box; and as there is a gradual adoption of the money-boxes, as the old style gives place to the new more and more (which will be as circumstances require, or as meters are put into the makers' hands for repairs), it is hoped that the pilfering of meters will in time be altogether a thing of the past in Leicester. Of course, all new meters are having the patent box attached, as the Gas Committee and Mr. Colson are not minded to perpetuate—except so long as is reasonably necessary with the gas-meters now fixed—even the memory of a thing that has given so much trouble not only to the Gas Department, but to the police and to the magistrates; and in this the Corporation are freely supporting the Gas Department. Even the labour members are eloquent in urging the protection of the poor prepayment consumer by the slight additional expenditure per meter involved. We certainly think that Leicester's success has made out a splendid case for the adoption of a special and stronger cash-box for prepayment meters.

Masonic.—Bro. J. Winson Scott, well known in the gas profession from his connection with the firm of Messrs. R. & J. Dempster, Limited, of Manchester, was last Wednesday installed W.M. of the Lodge of Integrity, No. 163, in the Province of East Lancashire.

SOUTH METROPOLITAN GAS COMPANY.

The Half-Yearly Report.

THE following is the report of the Directors of this Company for the six months ending Dec. 31, which, with the accounts for this period (see p. 357), will be presented to the proprietors at the half-yearly meeting to be held on the 13th inst.

It is very commonly supposed that those who control gas companies are strangers to all business anxieties and difficulties. Years ago that might have been to some extent the case; but it is now very far from true. In the old days, prior to the first coal panic in 1872-3, the price of coal was uniform from year to year; the price of coke as a general rule varied little except in very cold weather; and in the tar and ammonia markets speculators did not cause great fluctuations in prices. Municipal trading had not begun, and municipal debts were, therefore, generally non-existent, and rates were at a moderate and practically constant figure. This is now all changed; and, especially since 1889, the desires and the efforts of the Directors to reduce the price of gas have been repeatedly thwarted. The reduction to 2s. per 1000 cubic feet made at Midsummer, 1904, has been difficult to maintain, owing to an unexpected fall in the price of coke, and later to a rise in that of coal and the great increase in rates. In the three December half years, there have been deficiencies, met by the balance brought forward; while in one only of the two June half years was there a small surplus. But, notwithstanding these difficulties, the 2s. price has been maintained.

In the half year under review, coal—although somewhat less has been used, owing to a greater yield of gas per ton (due to improved working) and to a reduction of nearly one-half per cent. in the quantity of gas sold—has cost £23,684 more than in the corresponding half of the previous year. Coke and breeze, however, have yielded £17,726 more; but, on the other hand, tar and ammonia have produced £5492 less—the net deficiency on these items being about £12,000. Rates are £4818 more—an increase of over 12 per cent. The Directors have consequently been compelled to undertake an expensive appeal to the Sessions against some recently increased assessments, for they will not submit to what they feel to be very unfair treatment by some of the Unions. These extra expenses, and a slight falling off in the receipts for gas, result in a deficiency on the half year of £15,313. The shareholders are entitled, at the present price of gas, to a dividend of £5 14s. 8d. per cent. They have received 5½ per cent. since June, 1904; and the Directors recommend that a dividend at that rate per annum be again paid.

The coal contracts made last April were at an advance of about 1s. per ton, which meant an addition of £60,000 to the year's coal bill. Since then, owing to an extra demand for this class of coal for iron making and for export, there has been a further considerable rise—not because demand exceeds supply, but because the coalowners at such times advance prices, often by agreement among themselves; and if buyers respond, there is no reason why the advance should not go on to any extent. There is no scarcity of coal, and never has been, in any of these panics. The gas companies are probably the best customers of the collieries that supply this class of coal; and instead of acting as isolated units, they should act unitedly, and refuse to pay unreasonable prices such as those just given by the Copenhagen Municipality, who have chosen the worst time of the year for making their contracts.

The slight decrease in consumption is certainly due to the increasing adoption of the incandescent mantle, for the Company's business is constantly increasing. Compared with the December half of 1905, there are 14,401 more consumers, mainly using slot meters; and 13,358 more cooking-stoves have been supplied. There has also been a considerable increase of gas-fires, gas-engines, and other industrial applications of gas for various purposes. Referring to the reduction of consumption caused by the increasing use of the mantle, it is not for this Company to complain, seeing that they took the lead five years ago, supported by thirty or forty gas companies and corporations supplying gas, in obtaining free trade in cheap mantles for Great Britain, as had been the case in Germany for several years.

These troubles and difficulties are only temporary, and will pass away or be overcome. On the other hand, the Company have two great sources of permanent satisfaction. The confidence and goodwill of consumers have been gained by many years of fair and considerate treatment. This policy of the Directors has been loyally and sympathetically carried out by the Company's officers and workmen, who come in contact with, and therefore represent, the Company to the consumers; and its success is largely due to their co-operation. The other ground of satisfaction is to be found in the happy relations that exist between the Company and all the employees, rendering capital and labour difficulties and anxieties, so common elsewhere, utterly unknown here. The employees as shareholders have an effective interest in the Company, which is increasingly manifested year by year.

The number of shareholders is 14,804. Of these, 8263 are consumers of gas, who can be of service to the Company in various directions, and 4119 are employees; and, as partners in the concern, it is their interest as well as their duty to promote efficiency, economy, and the general welfare of the Company.

SALES OF COKE.

[COMMUNICATED.]

SOME excuse must be made for introducing the subject of coke sales at a time when so much improvement is being shown in the coke market; but slack times will come, and it is for the future that preparations should be made.

Gas managers so frequently have the greatest of difficulties in disposing of their coke at satisfactory prices, that any means to increase its popularity as a domestic fuel is greatly to be desired. Few people—and these are chiefly confined to quite the poorer classes—are aware of the economic properties of coke for household purposes; and this is a matter for surprise when its advantages are considered. In cleanliness and cheapness, it altogether surpasses coal. Coke would be more generally used but for the fact that most people have the mistaken idea that a special stove is needed for the purpose. This was shown to be quite unnecessary by Sir Charles Cookson at a meeting of the Smoke Abatement Society. This gentleman strongly advocates the use of coke in the ordinary kitchen and sitting-room grates. Speaking from experience—as he burns nothing but coke in his own house—he claimed that great economy, coupled with many other advantages, could be effected by the use of this fuel. Yet another speaker, endorsing Sir C. Cookson's opinions, expressed the opinion that "coke has all the advantages, but none of the disadvantages, of coal. The ashes were clean and the grates were clean. There was a noticeable absence of smuts and black dust and dirt in the room, far less work for the servants, and none for the sweep."

But it is with coal and coke mixed that, speaking generally, the most satisfactory results are obtained; the fires can be made brighter, clearer, hotter, and cheaper than if coal alone is used. The reason for this is that the tar in the coal has the effect of binding it into a solid mass through which the air cannot percolate, with the result that the fire will die out unless frequently stirred; but where a mixture is used, the coke effectually counteracts the binding tendency of the coal, and gives to the fire the required ventilation. Several gas companies—and prominent among them may be mentioned the South Metropolitan and the Croydon—advertise the advantages of a mixture of coal and coke. It was to demonstrate these advantages that the writer recently made some tests in an ordinary kitchen grate; and the results obtained fully bear out the above statements.

Weight Mixed.	Weight Used.	State of Fire.	Order of Merit.	Cost per Day.	Cost per Annum.
	lbs.			d.	£ s. d.
I. Coal 30 lbs. .	23	Moderate.	3rd	2·87	4 7 3
II. Coal 15 lbs. . Coke 15 lbs. .	20	Good clear fire. Great heat.	1st	2·32	3 10 7
III. Coke 30 lbs. .	17	Moderate.	4th	1·82	2 15 4
IV. Coal 10 lbs. . Coke 20 lbs. .	18	Good clear fire.	2nd	2·03	3 1 8

The costs are calculated on the basis of coal at 1s. 2d. per cwt., and broken coke at 1s. per cwt.

On each day the fire was kept up for fourteen hours. A very large fire was maintained on the second day for four hours, for making bread. From the above table, it will be noticed that coal, when used alone, proved to be the most expensive; while it only ranked third in order of merit. Coal and coke equally mixed gave the most satisfactory results at a moderate cost; while one-third coal and two-thirds coke made a good fire at a low cost—a fire that would be good enough for almost any purpose. Coke alone is the most economical of all, and would be found satisfactory for use when a moderate fire only is required, or on occasions when a fire has to be kept alight for some hours without being used.

The writer makes a practice of using a mixture of coal and coke in all rooms, and can testify that great benefit is derived from so doing. The saving is considerable, as is shown in the accompanying table; while the fires are much hotter, and retain their heat for a long time without attention. The writer has lately made a practice of ordering an equal number of sacks of both coal and coke, and has given instructions for the sacks to be shot alternately into the cellar. This saves the necessity of mixing. Of course, it must be remembered that a sack of coke only weighs half as much as a sack of coal; so that if an equal number of sacks of each are ordered, the mixture will be one-third coke and two-thirds coal—a mixture which proves very satisfactory for use in sitting-room grates, although a larger proportion of coke would be more suitable and economical for kitchen grates, where a strong draught may be obtained. Most people would adopt the use of this mixture if the beneficial and economical effects were made apparent to them. Of course, many people are so conservative that it is almost an impossibility to persuade them to depart from their customary practices; yet in many towns the gas companies are gaining such a good reputation for zealous and careful attention to their customers' interests, that it should not be a difficult matter to introduce to their notice the advantages of using a proportion of coke with their coal. Having once obtained a connection, the method would quickly recommend itself.

The next question to consider is the best means to provide the

broken or small coke for disposal to customers. The method of which the writer has experience is a very good one, and has the advantages of being efficient and economical. The coke and breeze are taken from the retort-house in trucks and are tipped together on the heap. After the large coke has been loaded into vans or trucks from any part of the heap, the breeze and small coke are carted to a coke screen, where it is shot into a large sort of trough holding about a ton and forming the boot of an elevator. This shoots the breeze and coke into an overhead rotary screen, where it is separated into three distinct sizes—breeze, small coke, and large coke—and deposits each sort into a different hopper.

The screen, which is some 8 feet in length, is drilled with 1-inch holes for a distance of 4 ft. 6 in., and the remainder with 2-inch holes. The breeze, of which there is much the largest proportion, drops into the first hopper and the small coke into the second hopper—the large coke passing straight through. The proportion of small coke varies from one-fourth to one-fifth, and the larger coke from one-tenth to one-twentieth. The breeze is thence removed from the hopper by trucks to the boiler-house, or loaded direct into sacks by means of a funnel fixed on the hopper door. The coke can be loaded into vans, trucks, sacks, or barrows, whichever is most convenient. The work of feeding the elevator and loading trucks, vans, sacks, &c., can be done for about 4d. per ton, basing it on a daily quantity of about 40 tons; while the power required for driving an elevator and the rotary screen is very small. The extra price of 1d. per cwt. obtained for broken or small coke should alone pay the wages bill.

Many works are in the habit of breaking coke for sale. This seems quite unnecessary, as in most works, and especially where stoking machinery is in use, there is sufficient small coke already made to satisfy the demand; besides, in breaking coke, a certain proportion is unavoidably lost, being broken into dust and breeze. In small works where all the coke is drawn from the retorts by hand, it would no doubt be necessary for the coke to be broken to supply any considerable quantity. Some gas managers with a good local demand for coke may not see the necessity for pushing the sale of broken coke; but there are many, especially those in residential districts, who would find a good connection among private consumers a valuable asset in slack times.

GAS UNDERTAKINGS RETURNS.

THE returns relating to the gas undertakings of the United Kingdom for the year ending Dec. 31, 1905, in the case of the Companies, and March 25, 1906, for the Local Authorities, were issued yesterday—just about three weeks earlier than was the case last year.

Particulars are furnished this year in reference to 752 undertakings, compared with 734 before. The new-comers among the Companies are Andover, Aylesbury, Brentwood, Corbridge, East Cowes, Epping, Haslemere, Hayling Island, Hessle, Hitchin, Sandiacre, Seaham, Staveley, Tavistock, and Ystalyfera. Chard drops out, and appears in the list of Local Authorities, the total number of which is 270, compared with 265 before. The new entries among the latter are Chard, Kirkby-in-Ashfield, Rickmansworth, Bangor, and Omagh. The capital authorized for the 752 undertakings (including other purposes than gas supply in certain cases) is £144,262,219, of which £124,194,221 has been paid up and borrowed. The total receipts are: Companies, £17,617,598; Local Authorities, £9,636,107—making the total receipts, £27,253,705.

The statistics relating to working show that 14,480,325 tons of coal were carbonized; the quantity of gas produced being 174,904,791,000 cubic feet, of which 161,407,725,000 cubic feet were sold. The total make is inclusive of 19,736,859,000 cubic feet of water gas and 101,250 cubic feet of acetylene gas. The totals in the preceding returns were: Coals, 14,295,602 tons; gas made, 168,647,676,000 cubic feet, of which 155,579,725,000 cubic feet were sold; the make being inclusive of 18,752,500,000 cubic feet of water gas and 103,500 cubic feet of acetylene gas. The extended use of water gas is shown by the following figures in the totals for the Companies in the past seven years. In 1899, the quantity supplied was 7,121,198,000 cubic feet; in 1900, 8,945,670,000 cubic feet; in 1901, 11,410,279,000 cubic feet; in 1902, 12,407,734,000 cubic feet; and in 1903, 13,056,741,000 cubic feet; while in 1904 the make was 13,718,857,000 cubic feet, and in 1905, 14,762,584,000 cubic feet (the sales in these two years not being given). The figures for the Local Authorities are: In 1899-1900, 2,955,828,000 cubic feet; in 1900-1, 3,162,782,000 cubic feet; in 1901-2, 3,955,621,000 cubic feet; in 1902-3, 4,459,916,000 cubic feet; in 1903-4, 4,850,007,000 cubic feet; in 1904-5, 5,033,643,000 cubic feet (make); and in 1905-6, 4,974,275,000 cubic feet (make).

At the date to which the last returns were made up, there were 30,931 miles of mains in use to supply 5,064,075 consumers and 665,791 public lamps. The preceding figures were: Miles of mains, 30,890; consumers, 4,737,177; public lamps, 654,183.

With regard to carburetted water gas, the returns show that when they were made up it was being supplied by the following Local Authorities and Companies; the maximum proportions of its admixture with coal gas (except where averages are stated) being given in parentheses.

Local Authorities.

Accrington (20).	Edinburgh (18·5).	Oldbury (20).
Barrow-in-Furness (15·9).	Halifax (11).	Oldham (‖).
Belfast (50).	Hebden Bridge (20 to 25).	Paisley (¶).
Birkenhead (33·3).	Leeds (25†).	Smethwick (20).
Birmingham (25).	Leigh (2·78).	Southport (51·37).
Blackburn (25).	Lincoln (33·33‡).	Stafford (19·7).
Burnley (35).	Longton (36).	Stockport (23·21).
Carlisle (28·74).	Loughborough (25).	Stockton-on-Tees (30·1).
Chorley (31).	Manchester (§).	Tipton (3·91).
Coventry (36·43*).	Middlesbrough (no limit).	Todmorden (17).
Dundee (25).	Nottingham (6·14).	West Bromwich (19·32).

* For one day only. † At one station only. ‡ In daytime; none at night. § 22·46 per cent. on total output. ‖ 36 per cent. at one station only on one day only. ¶ Oil gas 1·85 per cent.

Companies.

Alliance and Dublin (51).	Guildford (25 to 33⅓).	Ramsbottom (25).
Aylesbury (20).	Hampton Court (29).	Reading (34).
Barking (17·5).	Harrow (48).	Redhill (32).
Bath (50).	Hartlepool (†).	Rochester (34·7).
Bexhill (37·04).	Hastings (44·17‡).	Romford (23·4).
Bournemouth (30).	Hornsey (42).	Rushden and Higham Ferrers (21·25, av. 14·1)
Bilston (about 10).	Horsham (40).	
Bognor (not stated).	Hull—British (35).	Scarborough (25·80).
Brentford (39).	Ilford (20·8).	Southampton (34).
Bridgwater (33⅓, av. 22½).	Kingston-on-Thames (23).	Southend (50·07).
Bridlington (33).	Liverpool (50).	Southgate & District (52).
Brighton (39·58).	Lea Bridge (50).	Staines and Egham (25).
Cleethorpes (15).	Londonderry (17).	Stretford (29·91).
Colchester (23·38).	Maidenhead (36·3).	Swansea (22).
Commercial (41, av. 29).	Malton (about 25).	Swindon United (32·5).
Croydon (42, av. 34).	Marlborough (36).	Taunton (35).
Dartford (17·9).	Merthyr Tydfil (30).	Tonbridge (25).
Dorking (50).	Mitcham (44).	Tottenham (52).
Durham (20).	Newcastle (15·05 one wk.).	Tunbridge Wells (25 to 30)
Eastbourne (40).	Newport, Mon. (39).	Wandsworth (33).
Epsom (36).	North Middlesex (67·55).	Watford (32·04).
Falmouth (30).	Norwich—British (47·8).	West Ham (38).
Faversham (11·50).	Plymouth (43·67).	Weston-super-Mare (25).
Folkestone (40).	Portsea Island (35·5).	Wexford (20).
Gaslight and Coke (*).	Prescot (21·5).	Winchester (30).
Gosport (45).	Preston (48·4 av. for one week).	York (23·04).
Gravesend (45).		

* Of the total quantity of gas sent out by the Company, 11 per cent. was unmixed with water gas. As regards the remainder, 62 per cent. contained a maximum proportion of 27 per cent. of carburetted water gas; 8 per cent., a maximum proportion of 33 per cent; 12 per cent., a maximum proportion of 36 per cent.; 10 per cent, a maximum proportion of 39 per cent.; and 8 per cent., a maximum proportion of 40 per cent. † About 25 per cent.; average about 10 per cent. ‡ Average for the year, 32·28 per cent.

Six new Companies—Aylesbury, Bognor, Bridgwater, Reading Prescot, and Weston-super-Mare—appear in the above list. The only new Local Authority furnishing a return is that of Leigh (Lancs.); and Leicester drops out.

As in previous returns, particulars are furnished regarding the nature and quantity of materials other than coal used for the manufacture of gas, the supply of water gas, and the maximum proportion of its admixture with coal gas. The extent to which oil, petroleum spirit, carburine, or "other material" is being utilized for the production of gas will be seen from the following list of Companies and Local Authorities who make returns:—

Companies.

Alliance and Dublin.	Gosport.	Plymouth.
Alton.	Grantham.	Portsea Island.
Aylesbury.	Gravesend.	Prescot.
Barking.	Great Marlow.	Preston.
Bath.	Guildford.	Reading.
Bexhill.	Halesowen.	Redhill.
Bognor.	Hampton Court.	Richmond.
Bournemouth.	Harrow and Stanmore.	Rochester.
Brentford.	Hartlepool.	Romford.
Brentwood.	Hastings.	Rushden and Higham
Bridgwater.	Hornsey.	Scarborough. [Ferrers.
Bridlington.	Horsham.	Shrewsbury.
Brighton and Hove.	Hull (British Co.).	Southampton.
Bristol.	Huyton and Roby.	Southend.
Canterbury.	Ilford.	Southgate and District.
Cleethorpes.	Isle of Thanet.	SouthSuburban(C.P.Co.).
Coatbridge.	Kingston-on-Thames.	Staines and Egham.
Colchester.	Lea Bridge.	Stretford.
Commercial.	Littleborough.	Sutton and Hooton.
Croydon.	Liverpool.	Swansea.
Dartford.	Londonderry.	Swindon.
Derby.	Maidenhead.	Taunton.
Dorking.	Malton.	Tonbridge.
Dover.	Marlborough.	Tottenham.
Durham.	Merthyr Tydfil.	Tunbridge Wells.
Eastbourne.	Mid Kent.	Tynemouth.
Epsom and Ewell.	Mitcham and Wimble-	Wandsworth and Putney.
Exeter.	Musselburgh. [don.	Watford.
Falmouth.	Newcastle-upon-Tyne.	West Ham.
Faversham.	Newport (Mon.).	Weston-super-Mare.
Folkestone.	Northfleet.	Wexford.
Gaslight and Coke.	North Middlesex.	Winchester.
Godalming.	Norwich (British Co.).	York.

Local Authorities.

Accrington.	Belfast.	Chorley.
Airdrie.	Birkenhead.	Coventry.
Alloa.	Birmingham.	Darlington.
Alva.	Blackburn.	Darwen.
Arbroath.	Blackpool.	Dundee.
Ashburton.	Burnley.	Dunfermline.
Ashford.	Bury.	Edinburgh.
Barrow-in-Furness.	Carlisle.	Glastonbury.

Greenock.	Manchester.	Southport.
Halifax.	Middlesbrough.	Stafford.
Hebden Bridge.	Middleton.	Stalybridge.
Helensburgh.	Mossley.	Stratford-on-Avon.
Hereford.	Nottingham.	Stockport.
Heywood.	Oldbury.	Stockton-on-Tees.
Ilkeston.	Oldham.	Tipton.
Kilsyth.	Paisley.	Todmorden.
Leeds.	Perth.	Torquay (St. Mary Ch.).
Leek.	Portsoy (acet. gas).	Walsall.
Leigh.	Rochdale.	Warrington.
Lincoln.	St. Helens.	West Bromwich.
Longton.	Smethwick.	Wigan.
Loughborough.		

The new names in the above lists are the Aylesbury, Brentwood, Bridgwater, Reading, Sutton and Hooton, and Weston-super-Mare Companies. On the other hand, the Aldershot, South Shields, Waltham Abbey, and Wilmslow Companies are absent. Among the Local Authorities, the new-comers are Ashford, Glastonbury, Nottingham, Stalybridge, and Wigan; while Dumfries, Glasgow, Keighley, and Leicester drop out. The Gas Commissioners of Portsoy used 11¼ tons of carbide of calcium in the manufacture of an estimated quantity of 101,250 cubic feet of acetylene gas, of which 67,485 cubic feet were employed for private and 23,664 cubic feet for public lighting—together 91,149 cubic feet, at the price of 6s. per 100 cubic feet.

Comparing the figures furnished by the present returns with those contained in similar returns for the previous nine years, it will be seen that the Companies show as follows:—

Year.	Share and Premium Capital Paid up.	Loan Capital Issued.	Capital Sold under Auction Clauses.	Premiums Realized.
1896. . .	£41,433,325	£8,185,710	£6,783,468	£3,512,818
1897. . .	42,368,976	8,891,218	7,248,545	3,405,345
1898. . .	44,134,488	9,360,293	7,786,216	3,995,781
1899. . .	57,937,016	11,451,134	10,031,384	4,301,820
1900. . .	59,638,877	11,775,642	11,030,474	4,867,124
1901. . .	62,775,845	12,201,533	11,815,348	4,701,958
1902. . .	64,299,112	12,829,925	12,902,864	5,238,898
1903. . .	67,417,798	13,451,381	13,829,567	5,129,028
1904. . .	68,953,306	13,775,734	14,645,691	5,563,994
1905. . .	70,605,726	14,176,599	15,644,995	5,412,406

Year.	Tons of Coal Carbonized.	Cubic Feet of Gas Made.	Number of Consumers.	Public Lamps Lighted.
1896. . .	7,681,770	80,015,323,004	1,439,272	308,180
1897. . .	7,963,465	84,040,175,901	1,549,627	314,451
1898. . .	7,958,669	86,705,722,752	1,670,847	319,007
1899. . .	8,321,187	91,794,898,282	1,817,649	324,166
1900. . .	8,426,853	94,869,749,232	1,945,825	326,813
1901. . .	8,580,365	97,386,618,553	2,048,359	326,209
1902. . .	8,520,004	99,676,048,000	2,197,987	333,308
1903. . .	8,528,823	101,490,084,000	2,385,348	335,363
1904. . .	8,673,343	105,311,980,000	2,588,917	343,908
1905. . .	8,722,145	109,823,682,000*	2,813,156	350,113

* Including 14,762,584,000 cubic feet of water gas. Number of cubic feet sold, 100,848,445,000.

The somewhat similar figures for the Local Authorities are—

Year.	Amount Borrowed, including Annuities (not deducting Repayments).	Receipts.	Expenditure (exclusive of Amount in the next Column).	Interest, &c., Paid.*	Net Profit after Payment of Items in preceding Column.
1896-97 .	£26,561,689	£6,639,342	£4,989,283	£1,136,789	£534,390
1897-98 .	27,376,324	6,759,883	5,058,705	1,161,171	554,014
1898-99 .	28,614,971	7,177,670	5,365,995	1,219,771	625,780
1899-00 .	29,658,730	8,048,089	6,155,725	1,280,168	663,189
1900-01 .	31,509,701	9,121,418	7,463,693	1,353,259	409,802
1901-02 .	34,045,442	9,300,567	7,630,856	1,467,232	414,091
1902-03 .	35,738,023	9,554,984	7,215,502	1,584,985	793,764
1903-04 .	37,103,279	9,819,685	7,182,008	1,700,405	967,194
1904-05 .	38,512,295	9,546,682	7,052,474	1,738,682	790,450
1905-06 .	39,401,896	9,636,107	7,085,710	1,799,094	798,210

* These figures include: (1) Interest paid on loans; (2) amount paid for annuities; 3) amount of loans repaid; (4) amount paid for redemption of annuities; (5) amount placed to sinking fund.

Year.	Tons of Coal Carbonized.	Cubic Feet of Gas Made.	Number of Consumers.	Public Lamps Lighted.
1896-97. .	4,614,969	47,026,280,408	1,406,456	232,464
1897-98. .	4,652,688	48,652,558,526	1,475,749	239,352
1898-99. .	4,883,148	51,441,272,030	1,578,291	247,857
1899-00. .	5,289,501	55,360,659,139	1,667,908	257,040
1900-01. .	5,479,435	57,138,062,255	1,767,464	278,343
1901-02. .	5,522,264	59,300,273,086	1,872,633	287,887
1902-03. .	5,589,215	60,902,739,000	1,970,738	294,828
1903-04. .	5,673,013	62,717,759,000	1,945,777	301,308
1904-05. .	5,622,259	63,335,696,000	2,148,260	310,275
1905- .	5,758,180	65,081,109,000*	2,250,919	315,678

* Including 4,974,275,000 cubic feet of water gas and 101,250 cubic feet of acetylene gas. Number of cubic feet consumed, 60,559,280,000.

PERSONAL.

A meeting of the officials of the Birmingham Corporation Gas Department was held at the Queen's Hotel on the 28th ult., to take leave of Mr. W. H. Barnes, who has been Superintendent of the branch office at Wednesbury for the past thirty years, and who has now retired after a total service of forty-seven years with the Corporation and their predecessors, the Birmingham and Staffordshire Gas Company. Mr. G. Hampton Barber, the Secretary of the Department, who presided, referred to the long and honourable service which Mr. Barnes had rendered to the gas undertaking, and spoke of the high esteem in which he was held by the Gas Committee and by his colleagues on the staff. On behalf of the subscribers, he presented Mr. Barnes with a Zeiss prism binocular field-glass and a pocket aneroid in silver. Mr. Henry Hack, the Chief Engineer of the Department, and some of the senior officials present, having addressed the meeting, Mr. Barnes made a suitable reply, which included some interesting reminiscences of his long connection with the gas undertaking. He left England for Egypt last Friday. Mr. Barnes is succeeded by Mr. F. W. Deane, who has been in the service of the Corporation for nearly twenty-seven years.

Mr. W. Wilson, the Manager of the Kirkintilloch Corporation Gas-Works, was last Tuesday appointed Engineer and Manager of the Falkirk Corporation Gas-Works, in succession to the late Mr. W. M'Crae, who resigned in December, and who died on the 22nd ult. Mr. Wilson, who is a young man—being only 31 years of age—is the son of Mr. Thomas Wilson, the Manager of the Coatbridge Gas Company. He was trained as a chemist in the office of Mr. R. R. Tatlock, Public Analyst and Gas Examiner, of Glasgow, and served a period as draughtsman with the Barrowfield Iron-Works, Limited. He was afterwards Assistant to his father at Coatbridge; and while in this position he designed and superintended the erection in the gas-works of plant of the value of £35,000. For about eighteen months he was Assistant-Manager in the Perth Gas-Works. Then for two years he was an assistant in the meter-works of Messrs. James Milne and Son, Limited, of Edinburgh. Five years ago he was appointed to the post in Kirkintilloch. Since he went there the price of gas has been reduced from 3s. 2d. to 2s. 2d. per 1000 cubic feet to ordinary consumers, and to 2s. for power purposes and public lighting. At the present time he is Vice-President of the Western District Section of the Scottish Junior Gas Association.

OBITUARY.

To the great regret of a wide circle of friends and acquaintances, the death took place in the early hours of last Thursday morning, at his residence, "Waverley," at Grappenhall, of Mr. William Russell Neil, a Director of Messrs. Fletcher, Russell, and Co., Limited. Mr. Neil had been only a short time unwell, and the news of his unexpected death, the immediate cause of which was the rupture of a blood-vessel, came as a shock to all the employees at the Warrington and Pendleton works. Mr. Neil was the second son of Mr. Alexander Neil, the Chairman of the Company. From his boyhood he had been actively connected with the works at Pendleton, and had been a Director of the Company about ten years. Of a kindly and genial disposition, he was highly popular among all the employees, especially those at the Palatine Works, in whose welfare he took great interest. He was well known and highly respected throughout the gas engineering trade. He was a Freemason, being a member of the "Lodge of Friendship," No. 2963, and of the "Mark" Lodge, Warrington. He was 37 years of age, and is survived by a widow and four children. The funeral took place yesterday at Grappenhall Church; and, as a mark of respect, the Palatine Works were closed for the day.

We regret to record the sudden death, last Wednesday, in his 77th year, of Mr. Isaac Adolphus Crookenden, who was personally known to a number of our readers from his connection with the gas and water supply of the Metropolis. Mr. Crookenden became closely associated with the former nearly forty years ago, when he was appointed Secretary of the Phœnix Gas Company, in succession to Mr. Charles Pridden, who relinquished the position in October, 1867, after thirty-seven years' service, on account of impaired health. Mr. Crookenden held the post till 1880, when the Company was amalgamated with the South Metropolitan Gas Company. In 1883, the Secretaryship of the East London Water Company became vacant by the death of Mr. James Bourne, and Mr. Crookenden obtained the appointment. Up till that time the meetings of the Company had been held with closed doors; but with the October meeting in 1883—the first the new Secretary attended—a departure was made, and representatives of the Press were admitted. The Company passed through some troublous times before their undertaking was transferred to the Metropolitan Water Board under the Act of 1902. But in their Secretary they had a thoroughly capable official, who was always ready to do battle for them in the face of public opprobrium; and his faithful services were duly recognized when the time came that they were no longer required. Mr. Crookenden was interested in several gas and water undertakings, and was a Director of the Barnet District Gas and Water Company.

THE CHEMISTRY OF GAS MANUFACTURE.

THE fourth edition of Mr. W. J. Atkinson Butterfield's handbook (Vol. 1) on the "Chemistry of Gas Manufacture"* has just been issued. This work was originally published as one volume; but, as the author in his preface remarks, the advances in the gas industry, rendering extensive revision and enlargement necessary, precluded its continuance as a single volume, and in 1904 the first half of the work—that dealing with the materials and processes of gas manufacture—was revised and issued as a separate volume. This part has again been subjected to revision, and is (with several pages of fresh matter) now published as the fourth edition. A second volume, covering "Testing and the Use of Gas," is stated to be in course of preparation. With the frequent and continued development of the various branches of the gas industry—which, in spite of all competition, is refreshingly progressive—text-books in many parts must obviously become out of date; and the need for revision is easily understood. It is much to Mr. Butterfield's credit that the call for his treatise is such as to require a new edition in practically less than three years; and it is not less to the credit of the industry that there are so many students and readers alike whose enthusiasm has apparently exhausted previous issues. The work, which is described as a "practical handbook," is divided into some seven chapters, and deals with the raw materials used, the processes and plant involved in the manufacture of coal gas, carburetted water gas, and oil gas, and enrichment by light oils.

In discussing raw materials, Mr. Butterfield gives an interesting and sufficiently full account of the changes which occur in coal formation, from cellular fibre to anthracite, with particulars as to their physical and chemical character. He also deals with methods of sampling, whether from barge, waggon, or store, and devotes some pages to the laboratory determination of the elementary composition of coal. A description is given of the usual method of practically testing gas coal by a small cast-iron retort taking a 2·24 lb. charge, with a condenser, two purifiers, and holder; the washer being stated as usually omitted. A book such as this should be educative rather than merely descriptive; and one wonders why the author does not suggest the incompleteness of the plant as "generally fixed." There is no reason why the experimental plant should not more closely accord with ordinary working; the ascension-pipe being provided, if necessary, with a hydraulic main, and a washer and scrubber being added to the purifying plant. If these conditions necessitated a slight vacuum, this could be managed by duly counterbalancing the test holder. Mr. Butterfield states that with the gas plant he describes both yield and quality are higher than is the case with ordinary working. This is well known; but the absence of back-pressure, scrubbing action, and other disadvantages from which coal gas usually suffers, might account for it.

Anthracite and coke are classed together as being suitable materials for the production of water gas. While, in point of fact, this is correct, it might be well, since the volume is concerned with town gas, to remind the reader that anthracite is not generally employed in gas-works for the purpose suggested. The chapter includes an interesting and useful description of the various petroleums employed in the manufacture of carburetted water gas, and also of the methods of their analysis. Tabulated results of gas-making trials of various oils are furnished; and these will be very handy for reference. At the end of the description of carburine and other light oils, the author curiously enough says that a "material which is serviceable for enriching gas at temperatures above that of the atmosphere, is naphthalene." The possibilities of naphthalene in this direction will not be disputed; but after all the trouble it has given, and is still giving, to gas manufacturers, it is strange to read of it as being "serviceable." Nevertheless, a useful table of naphthalene vapour tension is added. This chapter on raw materials (running into 65 pages) is well worth reading and studying. One would, however, suggest, to the author that in the next edition some reference to the storage of both coal and oil, the chemical changes and loss due to weathering, spontaneous combustion, and the like, should be made.

In the second chapter, Mr. Butterfield briefly describes retort-setting, methods of carbonization, and the necessary plant, including various forms of mechanical stokers. The purpose and value of this chapter are, however, to be found in the description of the chemical and physical reactions which take place in heating retorts and in the process of gas making itself. The author deals admirably with the phenomena of combustion in both the direct combustion furnace and the ordinary producer. The discussion of the problems of direct and gaseous firing would, however, be greatly helped if diagrammatically illustrated. At times, too, the meaning would be clearer if the sentences were shorter and less involved. In one case a sentence, taken at haphazard, runs into nine lines, and as a consequence loses in lucidity. The author deals with the consideration of the essential conditions governing the production of gas, and determining the nature and properties of its several constituents. What he says will well repay close and careful reading, and give the student a very good idea of the problems and difficulties of successful carbonization.

In passing, it may be noted that Mr. Butterfield seems to agree that the passage of water gas through the retort considerably increases the yield from the coal without any great loss of candle power. Under the heading of nitrogen distribution, it is pointed out that hydrogen passed over the coal under carbonization may cause no less than 35 per cent., instead of 14 per cent., of the nitrogen to be evolved as ammonia. Carbonic oxide also improves the yield. It would be interestiug, therefore, if the author could have stated how far the use of blue water gas containing both hydrogen and carbonic oxide had resulted in this way.

Mr. Butterfield gives careful consideration to the question of vertical-retort gas making, and incidentally suggests, in view of anticipations of large yields of gas by this method, that not more than 13,000 cubic feet of lighting gas as an extreme can be made from ordinary Durham coal and its tar. Anything beyond this approximate quantity must, he says, be obtained by infiltration of carbonic acid and atmospheric nitrogen, and this should be remembered when extravagant claims are made.

In the description of gas-works plant, the author cannot be considered happy; and the student should not depend too much on either letterpress or illustration for his information of the style of apparatus in general use. In dealing, for instance, with the cross section of ⌂ retorts, prominence is only given to the 20 in. by 13 in. section, that of 22 in. by 16 in. being referred to as a kind of afterthought. Ascension-pipes are described as being usually 5 inches in diameter. The illustrations of settings and furnaces, and particularly of bridge-pipes and hydraulic and foul mains, are crude, and far from typical. The author unnecessarily enters with full detail into the method of handling a three-man scoop, or of opening a mouthpiece-lid, and almost forgets more important matters—such as the relation of fuel consumption to the coke produced, the use of hot coke in the furnace, clinkering, the removal of coke, and the like. The descriptions of plant generally should certainly be revised, if not rewritten; and it would be well to rearrange the paragraphs dealing with exhausting and condensation, inserting them after rather than before (as at present) those dealing with inclined and vertical retorts and also power stoking machinery. At the same time, some fuller discussion of the question of vacuum and the use of retort-house equilibrium governors would be useful. It is right to point out these defects; for it is a pity that so admirable a treatise in other respects should be thus marred.

The third chapter covers the various branches of gas purification; and in this section the reader will find nearly all that he requires for the study of the chemistry of washing, scrubbing, and the processes required for the elimination of the carbonic acid, sulphuretted hydrogen, carbon bisulphide, and other impurities. The author had previously given a table of the constituents of coal gas after condensation, and their percentage proportion; and he now adds a similar table showing those which it is necessary to remove from the crude gas. His general description of the chemistry of purification is exceedingly interesting, and affords much food for thought. There are times when one is disposed to disagree with him; but this is inevitably due to the many points in the fields of gas manufacture and purification which have still to be settled.

It is to be remarked that, in discussing tar-extractors, the author describes the "P. and A.," with but slight allusion to English forms. Tar fog is not mentioned; and very little is said about the effect of temperature on the washing and scrubbing processes. Beyond a bare sentence that an oil-charged washer sometimes follows the "P. and A." condenser, Mr. Butterfield makes no reference to the various and important steps taken of late for the removal of naphthalene. This is unfortunate; for the issue of his book offered a good opportunity for the discussion of the subject, and there is sufficient matter if only in the presentment of recently enunciated views. In other respects, the chapter has been brought up to date, as in the case of the description and illustration of the Jäger grids. Again, in dealing with the removal of H_2S, the chemical formulæ showing the general reaction with ferric hydrate are given; but no similar formulæ are furnished when discussing the elimination simply of CO_2 and H_2S by means of lime. Undue notice is perhaps given to the employment of Weldon mud; and one is led to infer that it is in fairly general use. The chapter contains useful information as to the methods of determining the purification value of lime and oxide.

A book on illuminating gas, to be comprehensive, must treat to some considerable extent of carburetted water gas, since its manufacture is carried on in many towns. The author states that two-thirds of all the gas made in North America is of this variety; and recently a claim has been made by a prominent firm that one-third of the town gas consumed by English-speaking peoples is now carburetted water gas. Chapter IV. is devoted to the subject, and contains valuable information as to both the intermittent and continuous systems of the manufacture of water gas. Thoughtful attention is paid to the theoretical considerations—both physical and chemical—involved in the process. The description and diagramatic illustration of a carburetted-gas plant are good; and the method of manufacture is clearly indicated. It may be said, indeed, that the chapter on carburetted water gas is—in matter and style—one of the best in the book. The author gives sufficiently full details of working as well as of the resultant gas, including a typical analysis of the latter. Useful figures are adduced, showing the groundless character of agitation against carburetted water gas on the part of those ignorant of its constituents. A few particulars are given in the chapter

* "The Chemistry of Gas Manufacture. Vol. I., Materials and Processes." By W. J. Atkinson Butterfield, M.A., &c. London: Charles Griffin and Co., Limited; 1907.

of the Dellwik-Fleischer and other methods of making simple water gas, and also of the use of this gas for self-enrichment processes. The author had already, in Chapter II., furnished some results of the blending of water gas with coal gas in retorts.

Chapter V. discusses various methods of making neat oil gas —such as the Pintsch, Tatham, and Peebles—mainly in view of its subsequent use as an enricher of poor gas. This is followed by a short chapter on carburation by means of carburine, benzol, and other spirits. Mr. Butterfield states that with gas of from 15 to 17 candles, a gallon of carburine raises about 8000 cubic feet 1 candle in illuminating power; and he regards this as being permanent. It can scarcely be said that gas of this quality requires enrichment; and it would have been more interesting and serviceable if Mr. Butterfield had been able to give figures proving or otherwise the permanence of the enrichment with gas of lower grades.

The last chapter is a mistake. It is obviously impossible in the compass of 9½ pages to treat of such varied subjects as carbonization of tar, station-meters, pressure-governors, gasholders and tanks, and several other diverse matters. The subject of tar carbonization merits some discussion, even if the process is accompanied by many difficulties; and this should properly come in Chapter II. Mr. Butterfield's work on the chemistry of gas manufacture is done, and on the whole well done, when he reaches the station-meter; and the constructural details of gasholders and tanks might well have been omitted. It would have been sufficient to have discussed here the physical conditions to which gas is subject while in the holder, and such matters as the possibilities and reasons of, say, naphthalene depositions at the holder inlet and outlet pipes.

In spite of the criticisms in this review, the book is a worthy contribution to technical literature on gas manufacture. Not only students, but all those in charge of, or interested in, gas-making operations should possess and study the work; and they will have read badly if they do not gain in their general knowledge or give fresh consideration to many of the problems of gas economics. We look forward with considerable interest to the issue of Mr. Butterfield's second volume.

THE GAS SECTION AT THE NEW GERMAN MUSEUM AT MUNICH.

An account has recently been given in the "Journal für Gasbeleuchtung" by Dr. E. Schilling, of Munich, of the exhibition of articles connected with the gas industry which has been prepared by him on behalf of the German Association of Gas and Water Engineers for the new museum at Munich. The permanent building for the reception of the museum is not yet completed; its foundation-stone having been only laid by the German Emperor a few months ago. The articles are, therefore, temporarily housed in an old cavalry barracks in the city.

The gas exhibit consists of ten sections, covering every branch of the industry, from raw materials to bye-products and appliances for the combustion of gas. In the first section, specimens of the commonest gas coals and of the coke obtained from them are shown, with diagrams and samples representing the yields of the various products obtained during carbonization, &c., as well as comparative samples of the coke made in a horizontal retort, a vertical retort, and a coke-oven respectively. The section also includes the Bunsen-Schilling apparatus for determining specific gravity, the Elster and the Lux gas-balances, Erdmann's gas-tester, two different "Verificateurs" by Giroud, a Junkers calorimeter, a complete Bunsen apparatus for gas analysis, &c.

Another room is devoted to the evolution of the modern retort furnace. Starting with the small iron retort used by Degner in 1818 to supply gas to a street-lamp in Schweinfurt, and an old cast-iron retort used by the Imperial Continental Gas Association in 1826, models or diagrams are exhibited of every form of iron or fire-clay carbonizing vessel employed up to the most recent date. The progress of regeneration is exemplified by a drawing of the first furnace built by Oechelhaeuser in 1876, and a model of the Munich furnace which can be taken to pieces. The same section includes a cameo of Dr. N. H. Schilling presented by the Association, and a copy of the first volumes of the "Handbook" and "Journal" published by him. Models of an inclined fire-clay retort-setting, of a Merz coke-conveyor, and of the new Nuremberg retort-house are exhibited, together with drawings and photographs of the Pintsch carburetted water gas plant in use in Charlottenburg and the Dessau vertical retort furnace. Elsewhere are found a drawing of the first gas-works built by Clegg in London in 1812, plans of the resin-gas works constructed by Schiele for Frankfort in 1828, and a drawing of the Imperial Continental Gas Association Cologne works in 1840. Among the apparatus is an original two-blade exhauster from Munich, a Dessau speed-regulator, and a Pelouze tar-separator. Numerous washers, scrubbers, station governors, and model gasholders are shown; the centre of the apartment being occupied by a complete model, no less than 13 feet long, of the new gas-works at Mosach, near Munich.

Another section comprises old and new gas-mains constructed of clay and cast iron. Syphon boxes, valves, and pipe joints are shown in great variety; this branch of the subject being illustrated by a vertical section of a street showing all the objects lying underground, and a plan of the long-distance gas transmission at St. Margrethen. Yet another section covers wet and dry gas-meters. Types of each meter with glass cases, and also sections in different directions of the modern prepayment meter, can be seen. Among the old apparatus is a dry meter made by William Richards, of London, in 1862, a wet meter made by Elster in 1858, and a wet meter made by Smith, of Hamburg, in 1862. The final section of the manufacturing branch includes a model public acetylene supply, an Amberg air-gas apparatus, and several drawings and diagrams of "aerogen" air-gas works.

In the department of combustion, considerable emphasis is thrown upon early methods of lighting, by the presence of pine torches, candles, and oil-lamps. Various hanging oil and paraffin lamps used in Paris, Nuremberg, and elsewhere are shown in the form of specimens or diagrams. A reproduction of the decree of the French Parliament, dated June 17, 1524, is shown, whereby the citizens of Paris were ordered to illuminate the streets by placing candles in their windows; while there is also an order issued by the authorities of Nuremburg in 1699, stating that nobody must be out at night without a lighted candle in his lantern. An original gas-burner as used in the street-lamps of London in 1814 is exhibited, followed by the various slit, regenerative, and intensifying burners which preceded incandescent mantles. Modern methods of lighting are shown by numerous specimens of upturned, inverted, and intensified incandescent gas burners, burners consuming compressed gas, an acetylene lamp, and an incandescent petroleum burner. As all the burners and lamps can be lighted, an admirable picture is afforded of the progress of the gas industry. On the walls are tables showing the various capacities and duties of the burners below, of which the accompanying table is a translation into British figures :—

—	Cubic Feet per Hour.	Candle Power.	Candles per Cub. Ft.
Iron jet burner	1·77	2·27	1·28
Iron two-hole burner	5·30	6·82	1·29
Steatite slit burner	5·66	14·55	2·57
,, fishtail	5·66	16·35	2·86
Bray burner	12·72	32·8	2·57
Argand	8·83	29·1	3·3
Incandescent with mantle of pure thoria	3·89	5·0	—
,, ,, ,, ,, ceria	3·18	1·82	—
Welsbach	4·24	72·7	17·2
Inverted incandescent	3·18	81·8	25·7
High-pressure burner	9·54	273	28·6
,, ,,	22·3	636	28·6
Air gas	21·2	273	12·9
Ordinary acetylene burner	0·85	36·4	42·8
Incandescent ,, ,,	0·53	54.6	103

In the department of incandescent gas, two of Welsbach's first experimental burners are shown, accompanied by samples of cotton, ramie, and all the apparatus and articles used in the manufacture of mantles. Igniting devices of various kinds are also on view. In the heating section, boilers, cookers, hot-plates, and room-warming stoves are shown, and also a model of the most modern hot-water radiator with gas firing.

The shortness of the time at Herr Schilling's disposal has prevented the exhibition of articles connected with the gas industry from being as comprehensive as could be wished; but it is to be hoped that the various lacunæ remaining will be soon filled.

Water Gas Interdicted for Paris.

The Paris Municipal Council have lately been occupied in settling the conditions of the new gas concession; and during the past few days the subject of water gas has been very much to the front. The member who has charge of the matter (M. Desplas), and also the Prefect of the Seine, wished to have it left with the Administration to authorize the future concessionary to make water gas, under certain conditions, and mix it with coal gas in the proportion of 15 per cent. The question was debated with some warmth on both sides. On the one hand, it was pointed out that water gas is in use without serious results in many foreign cities; and it was urged that Paris should not be afraid to follow these examples. But the opponents supported their arguments by citing numerous scientific experts—such as MM. Gréhant, Moissan, Armand Gauthier, and others—who have demonstrated the toxic property of carbon monoxide; and they were backed up by the "Matin," who on Friday, when the discussion was brought to a close, came out with a rather sensational article in which it was stated that Professor d'Arsonval and physiologists, hygienists, and doctors without exception had condemned water gas. So much science arrayed against practical experience probably frightened some of the waverers, and led them to oppose the perfectly reasonable proposition of the Prefect of the Seine. At all events, when the Council were asked to vote upon a motion by MM. Navarre and Fribourg, to interdict altogether the making of water gas, it was carried by 37 votes to 35. Whether by doing this they have, as the "Matin" thinks, acted with wisdom, remains to be seen; because the permission to manufacture water gas was one of the most important factors in forming an estimate of the profits to accrue to the Municipality under the new concession

PROVISIONAL ORDERS FOR 1907.

In the three preceding issues of the "Journal," the principal features of the Water Bills for next session were dealt with. We now notice the Provisional Orders.

The Dorking Water Order is to empower the Dorking Water Company to raise additional capital to an amount not exceeding £15,000 by the issue of new ordinary or preference shares or stock, and to borrow on mortgage any sum or sums not exceeding one-fourth of the new capital actually issued, including premiums. The additional capital is to be offered by auction or tender, and is to carry 7 or 5 per cent. dividend according as it is issued as ordinary or preference.

The Herts and Essex Water Order is to authorize the Herts and Essex Water Company, Limited, to enlarge their area of supply and raise additional capital. If the Order is granted, the parishes of Roydon, Great and Little Parndon, and Nazeing, all in the county of Essex, will be brought within the Company's limits. The Order contains a number of provisions for the protection of the Hertfordshire County Council, the first of which makes it unlawful for the Company to supply, in bulk or otherwise, water derived from any source in the county or in the watershed of the River Lea, beyond or for use beyond the limits. The amount of additional capital applied for is £75,000, with borrowing powers to the extent of one-third. It is to be put up to auction or tender, and any not disposed of is to be offered to the shareholders. Ordinary capital is to carry 7 per cent. and preference capital 6 per cent. dividend. The Company wish to be authorised to sell, but not manufacture, pipes, valves, meters, and appliances used in connection with the supply of water.

The Mid-Kent Water Order is to empower the Mid-Kent Water Company to extend their limits of supply so as to include a number of parishes in the county of Kent. One of these is Sutton Valence; but the Company undertake not to supply water in the parish until after they have acquired the undertaking of the Hollingbourne Rural District Council, or have obtained the consent of the Council given under their common seal. Another parish to come within the new limits is Woodchurch; and it is proposed to repeal so much of the Cranbrook District Water Act, 1898, as authorizes the Cranbrook Water Company to supply the first-named place. The applicants ask for authority to raise additional capital not exceeding £20,000, borrow to the extent of one-fourth, and create debenture stock subject to the provisions of the Companies' Clauses Act, 1863, and section 36 of the Company's Act of 1898. The dividends on the new capital are 7 per cent. if it is issued as ordinary, and 6 per cent. if as preference. [*Parliamentary Agents: Messrs. Roberts and Co.*]

The New Tredegar Gas and Water Order has already been noticed so far as the provisions relating to gas supply are concerned (*ante*, p. 145). For purposes of water supply, the Company require authority to raise additional capital not exceeding £2000, including premiums; but the entire water capital is not to exceed £9750 without special sanction. The dividends on the new issue are to be 7 per cent. if ordinary and 6 per cent. if preference; and borrowing powers to the extent of one-fourth are required, the interest on the money thus raised to be 5 per cent. as a maximum. Shares or stock not disposed of by auction or tender may be offered to shareholders, employees, or consumers. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

The following Orders have been applied for to the Secretary for Scotland, under the provisions of the Private Legislation Procedure (Scotland) Act, 1899.

The Glasgow Corporation Order is (*inter alia*) to sanction the acquisition by the Corporation of the undertaking of the Busby Water Company, who, by Acts passed in 1875 and 1882, were authorized to construct works and supply with water the village of Busby and the adjacent districts, in the parishes of East Kilbride and Carmunnock, in the county of Lanark, Mearns, in the county of Renfrew, and certain other districts and places in the parishes of Cathcart and Eastwood. An agreement has already been entered into between the Corporation and the Company for the sale of the undertaking for £29,763, *plus* the value of the stores on the 28th of May next, and the cost of new works and additions constructed and carried out (including pipe-laying) between May 28 last year and the date of the transfer. Notwithstanding anything contained in the Glasgow Water Acts, the Corporation ask for power, within the limits of supply of the Company, and in intermediate and adjacent places, to furnish any person with a supply of water for domestic purposes, where such person is not entitled to demand it under the above-named Acts, at rates and on conditions to be agreed upon; and for other than domestic purposes, on terms to be fixed by the Corporation. The supplies in these cases are not to prejudice the service within the Company's limits of compulsory supply. The Acts referred to are to apply to the Corporation; and the acquired undertaking is to form part of that of the Corporation. Borrowing powers are required to enable the purchase to be carried out. [*Parliamentary Agents: Messrs. Martin and Leslie.*]

The Kilmarnock Corporation Water Order is to authorize the Corporation to construct a reservoir on Loch Burn and on adjacent lands, a conduit or pipe-line therefrom to the existing conduit from Loch Burn to the Dunton reservoir, and make an access road. The Corporation seek power to raise, in addition to any other moneys they are at present authorized to borrow, a sum not exceeding £25,000 for the purposes of the Order. [*Parliamentary Agent: Mr. J. Kennedy.*]

The Paisley Corporation Order is to authorize, among other things, the construction of additional water-works, comprising a reservoir on the Rowbank Burn, another on the Rye Water, two aqueducts, and a road diversion, to be completed within fifteen years. Powers are sought to take and impound the waters of certain streams specified and their tributaries; and provision is made for the supply of compensation water. The Corporation wish to borrow a maximum sum of £155,000, in addition to the money they have power to raise under their Water Acts. On the expiration of seven years after the Corporation commence to construct the works, they will form a sinking fund so as to pay off in fifty years all the money borrowed and the funded debt created for water-works purposes under the authority of the Order. [*Parliamentary Agents: Messrs. Grahames, Currey, and Spens.*]

The Renfrewshire Upper District (Eastwood and Mearns) Water Order is to empower the Committee of the Upper District of Renfrew to construct and maintain water-works and supply water in their district, and also to authorize the District Council to acquire the undertaking of the Busby Water Company. The new works comprise two reservoirs, a filter or filters, and a clear-water tank or tanks, in the parish of Eaglesham, in the county of Renfrew, three embankments, four conduits or pipe-lines, and an access road—all to be completed within ten years. It is proposed that the transfer of the Water Company's undertaking shall be carried into effect on May 28, 1908; and that the price to be paid for it shall be £29,763, *plus* the value of stores and the cost of any new works carried out by the Company between May 28, 1906, and the date of transfer. All the Acts of the Company are to apply to the Council. The Corporation of Glasgow are not to be entitled to supply water within any part of the limits; and their Water Acts are to be repealed so far as they authorize such supply. It is proposed that the special water supply district of Malletsheugh, in the parish of Mearns, shall be absorbed in the Council's water undertaking, as from May 15, 1908. The usual powers are required to lay pipes and supply water for domestic and other purposes; but the District Committee are not to be under an obligation to furnish a supply to any person for less than 5s. in a year. The County Council may impose a public water-rate not exceeding 3d. in the pound. Borrowing powers are required in respect of the works specified in the Order. [*Parliamentary Agents: Messrs. Grahames, Currey, and Spens.*]

A Dust Interceptor and Regulator for Inverted Gas-Burners.

Under a patent recently granted to Mr. Richmond, Messrs. Willey and Co., Limited, of Exeter, are now manufacturing a dust interceptor which, it is claimed, provides an effective check for dust in inverted gas-burners besides regulating the pressure.

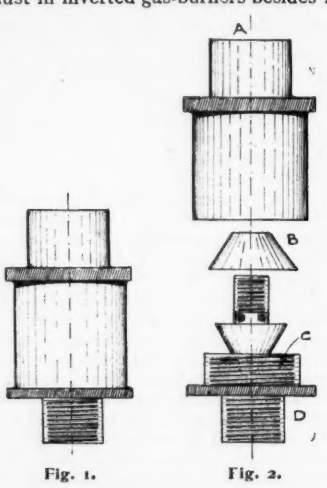


Fig. 1. Fig. 2. Fig. 3.

The construction is clear from the accompanying illustrations. Fig. 1 shows the interceptor complete; fig. 2, the interceptor taken apart for cleaning; and fig. 3, the gas-way. A is the internal thread to screw on the nosepiece of the fitting; and B, the top cone in position to prevent particles of dust from entering the gas-way in the burner and choking—thereby affecting the lighting power. To adjust the pressure of the gas, the cone is screwed either up or down, as required. C is the cavity which receives and retains all the particles of dust; and, once fixed, it will not require cleaning for months. D is the male-thread to screw into an inverted burner.

The Manchester and District Junior Gas Association will assemble next Saturday afternoon to hear a paper by Mr. R. H. Garlick, entitled "Some Observations on Gas Distribution." The meeting will be held in the Manchester School of Technology, Whitworth Street; and the author states that he has prepared his paper with a view of providing ample material for comment and discussion.

THE FIRST FOUR-LIFT (GADD AND MASON) SPIRAL-GUIDED GASHOLDER.

WIDNES is again to the fore. This time it is not a further reduction of the cheapest illuminating gas in the world, but it is in the successful inauguration last Tuesday—in, as an incident in the event, one of the finest gales that ever blew to test the endurance of a holder without outside supports—of a four-lift holder on the Gadd and Mason spiral-guided system. There have been a few columnless holders of greater girth and capacity than the new structure at Widnes; but this one (through circumstances which will be explained) now leads, to the best of our knowledge, in the matter of height for such holders. And Mr. Isaac Carr, the Corporation Gas and Water Engineer, who is responsible for the innovation in height, after his experience with one of smaller dimensions and capacity, has an absolutely composed mind on the question of the continued good behaviour of the holder. There was a little ceremony on Tuesday, and congratulatory speech-making in connection with the inauguration. But before sketching some of the speeches that were especially appropriate to the occasion, the event allows first a little peep into the history of the Widnes gas undertaking, and claims in the next place a description of the holder, with some special reference to its individual features.

PAST AND PRESENT POSITIONS OF THE CONCERN.

The Widnes Gas and Water Works were founded by a private Company in 1860, and in 1867 were acquired by the late Local Board, under the special provisions of the Widnes Improvement Act of that year. At the time of the transfer, the consumption of gas was 13 million cubic feet; and it has since increased to 284 million cubic feet. To meet the additional business, large extensions have been made, which bring the capacity of the gas-works up to 2 million cubic feet per diem, or (say) equal to a consumption of 400 million feet per annum.

The carbonizing plant at present consists of 406 mouthpieces, capable of producing 2 million cubic feet of gas per day. All the retorts are in one house, and in settings of sevens, fired on the regenerative system. Additional land has been acquired to increase the capacity of the works to 3½ millions per diem.

The gasholder storage station, apart from the gasholder just completed, is situated at Ditton, outside the borough boundary, and is 1½ miles from the gas-works. Here is an ordinary two-lift holder of 400,000 cubic feet capacity, and also a three-lift Gadd and Mason columnless gasholder of 700,000 cubic feet capacity, which was erected in 1893. [We will refer to the latter holder again presently, in showing what led up to Mr. Carr adopting the spiral-guided system for the four-lift holder.] The total storage capacity at Ditton is 1,100,000 cubic feet, and, with the new holder added, 2,100,000 cubic feet. There is a 12-inch governor and check meter at the Ditton station, for supplying gas to the Ditton, Halebank, and Hale districts. Sufficient land has been acquired at the Ditton site for the erection of additional works equal to a daily output of 1,500,000 cubic feet of gas.

The total number of consumers is 64[illegible], of whom 4240 are consumers on the "penny-in-the-slot" system.

The net selling prices of gas within the borough are 1s. 3d. and 1s. 1d., and for motive power 11d. per 1000 cubic feet. Consumers by prepayment meter are allowed 44 cubic feet for 1d., including service, meter, internal pipes, and fittings, with boiling-burner, also continual maintenance.

The illuminating power of the gas is 17 candles, as tested by the "London" argand burner at the 5 feet rate, notwithstanding the fact that the statutory standard is but 14 candles, as it is, in the stated opinion of Mr. Carr, "much to the advantage of the consumer to receive gas of what may be termed an economical quality." To put his contention in other words, had the present low selling prices been obtained by reducing the quality, the consumer would not have been the gainer. The prices now charged are lower than those of any other gas authority in the world.

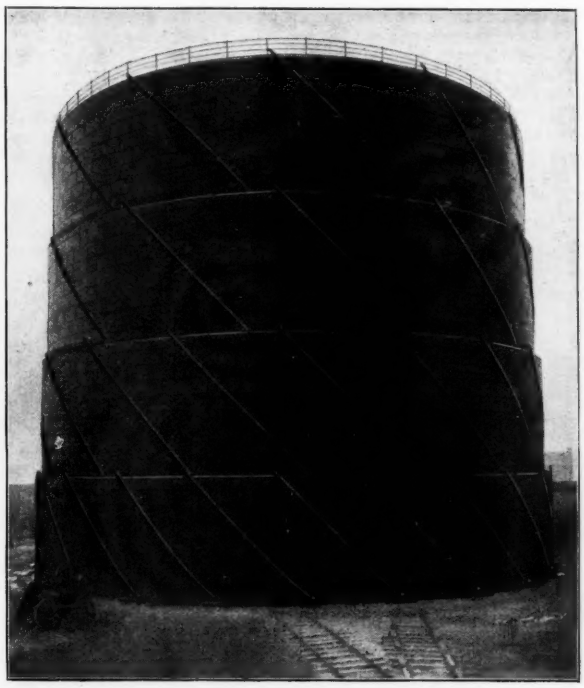
With regard to the price of 11d. per 1000 feet for power purposes, it is interesting to note that this gas, with a calorific value of 650 B.Th.U., is cheaper than Mond power gas at 3d. per 1000 cubic feet. Widnes gas at 11d. per 1000 feet develops 6 B.H.P. in a modern gas-engine per penny, or say 0·16d. per B.H.P.—a price considerably below that of a high-duty steam-engine, especially when costs of generating are included. Electricity also for power purposes, to be comparable with gas at the Widnes price, must be sold at ⅛d. per unit. There is, under these conditions, a big day consumption of gas—the day demand being almost as much as the night; and for this gas-engines are largely responsible.

The gas undertaking is a public benefactor in another way. It contributes to the relief of the general district rate of the borough by doing the whole of the public lighting free of cost. This amounts to £1915, or equal to a charge of 1·65d. per 1000 cubic feet of gas sold. This, again, is a point that is not generally understood in considering the price at Widnes.

The total capital expended on the gas-works—including the original purchase money—up to March 25 last, was £116,103, of which £36,520 has been paid off through the sinking fund and the profit and loss account, leaving the actual capital at £79,583, or equal to £2 12s. 3d. per ton of coal carbonized, or £280 per million cubic feet of gas.

THE FOUR-LIFT SPIRAL-GUIDED HOLDER.

Turning next to the new holder. It is some years since Mr. Carr decided to depart from the ordinary type of gasholder practice. Requiring a three-lift holder of 700,000 feet capacity, he made careful investigation as to the merits of the Gadd and Mason spiral-guided system. He was so far satisfied with the result of his investigation, that he decided to adopt the system for the then new holder; and accordingly he recommended his Committee to place a contract with the makers, Messrs. R. & J. Dempster, Limited, for a three-lift holder, having a total height, when fully inflated, of 75 ft. 9 in. This was a decided innovation, as up to that time no holder on the Gadd and Mason spiral-guided system had been erected of such a size. Since then experience has shown that the decision arrived at by Mr. Carr was based on the soundest judgment; and although a number of holders have been erected in England and various parts of the world, of heights approaching the first holder, it has again been left to Mr. Carr to go one step further, and erect a holder having an increased height. The original holder was, as mentioned, one of three lifts; the diameter of the inner lift being 110 ft. 9 in., the middle lift 113 ft. 3 in., and the outer lift 115 ft. 9 in. The holder that has now been erected is a four-lift one, having an inner lift 108 ft. 6 in. in diameter, a second lift 111 ft. in diameter, and an outer lift 116 ft. in diameter. The total capacity is about 1 million cubic feet. Whereas the lifts of the first holder were 24 feet deep, the present lifts have each a depth of 26 feet—thus giving to the holder an increased height of over 40 per cent.



The New Four-Lift Spiral-Guided Gasholder at Widnes.

It should be explained that the reason the holder was not constructed of a larger diameter was owing to the cramped position of the site, which is bounded on the four sides by a roadway, railway, foundry, and a large culvert. But this type of holder enabled Mr. Carr to make use of his space to the largest possible extent. Had the ordinary type of holder been adopted, the probabilities are that the holder would have been less than 105 feet in diameter, on account of the extra space required for the construction of the tank piers.

It will perhaps be of interest to many of our readers if we examine the construction of the holders, to see what improvements have been effected since the system was first commenced, as they have now had a sufficient trial to demonstrate their practical suitability or otherwise for the purpose for which they were required. One essential point for the success of a spiral-guided holder is that the rotary motion—amounting to one-third the circumference—should be accomplished with absolute freedom of action, so that there is no possibility of an increased pressure being thrown by the holder at any point of its rise or fall owing to the friction between the rails and the rollers. It was found that, in order to accomplish this successfully, it was essential for the

rails to be laid on a perfectly level surface, which was a difficult matter to surmount on account of the joints and rivets in the sheeting of the holder. Messrs. R. and J. Dempster, however, have now successfully overcome this difficulty by means of their patent spiral plate to which the rails are attached. By using this plate, which extends the full height of the lift of the holder, all joints in the sheeting are avoided; and this enables the rails to lie perfectly flat on the spiral plate, which is butt-jointed, with cover plates on the inside. This improvement materially adds to the strength of the holder to withstand heavy gales or snowstorms; and this alone has undoubtedly increased the popularity in which this type of holder is held by the gas profession.

One of the contingencies of the revolving motion of the holder is that, in the event of a strong formation of ice inside the tank, there is some risk of it overturning the inlet-pipe, unless proper precaution be taken against it. In the tank just constructed, a column of concrete is carried up round the pipe of sufficient strength to resist any lateral stress that may come upon it from ice thrust—thus rendering the pipe perfectly secure.

A further advantage that the flat plate previously referred to possesses, may not occur to one on a casual glance at the holder. But the makers have found that, where the spiral rails are attached either to the sheeting or to stronger plates, the steel rail cannot be satisfactorily bedded to the shell. Hence it follows that, when the water flows down the outside of the vessel from the crown, it percolates between the steel rails where they pass over the joints in the sheeting, and continual rusting takes place. It is impossible to prevent this, except by removing the rails and painting the sheets behind them.

Another patented improvement should also be noticed in this latest Widnes holder—this being the means that have now been adopted to prevent the unsightly appearance which holders have when fully inflated, owing to the action of the rain running down the side of the holder from the crown. This has undoubtedly spoiled the appearance of many holders shortly after having been painted; and in order to get over this difficulty, a novel arrangement has been adopted by extending the top sheet of each lift so as to form a basin round the crown or dips of the holder—openings being provided at each rail, so that any water accumulating can run down the rails into the cups or tank of the holder. It has been observed in spiral holders, that the paint on the part of the shell protected by the diagonal rail is in excellent condition long after the portion exposed to the dripping from the crown has rendered another coat necessary. This applies to ordinary holders as well as to spiral; but owing to the fact that the deposit from the crown is washed evenly over the sides, it does not present itself in such a vivid manner as when observed on the spiral type. This patent, which was illustrated in the "JOURNAL" for Dec. 5, 1905, p. 689, provides for the water being taken from the crown into the interior of the gasholder, should it be found desirable, so as to allow the circular ring round the top curb being continuous; and other means are also provided to this end.

Still comparing the holder with the one at the Ditton station, a further improvement is the increase in the number of spiral guides in the lower lifts, which increases the strength of the grip of the holder to the tank as the height increases. The number of rails on the top and second lifts is twelve, eighteen in the third, twenty-four in the bottom. This is especially important in this case, seeing that the holder extends to a height of 110 feet, or higher than any other columnless holder.

Reviewing these gasholders from their inception, the first one erected at Northwich had the steel rails on the inside of the lifts of the holder and inside the tank—the guide-rollers operating from the curbs and cups. This, of course, prevented inspection, and, this being desirable, the first Widnes holder had the steel rails fixed on the outside of the shells, and the guide-rollers on the dips and the top of the tank. But the difficulty was then experienced of satisfactorily securing the rails to the light sheeting; hence the spiral rail patent which has been so successful.

There are now upwards of 200 gasholders in operation; and it has been found at works where both types of holders are in use that, during heavy gales, it is desirable to turn on the gas from the spiral holder to the town, so as to ensure an even pressure, for, however carefully an ordinary gasholder may be controlled and the carriages adjusted, it is impossible, in Mr. Carr's experience, for it to resist movement during heavy wind pressure, whereas such oscillation is impossible on the spiral principle. The latter offers the same advantage so far as snowstorms are concerned; for the ordinary type may, through heavy drifts on one side, become tilted, whereas this is impossible with a spiral holder even if it is unequally loaded. During the heavy snowstorm experienced in Christmas week, an ordinary holder was practically wrecked at Farnworth, owing to snow drifting on the crown.

The elaborate steel guide-framing used in the construction of ordinary gasholders is a serious matter to keep in proper order, particularly in a manufacturing district, where the effects of the atmosphere upon the ironwork is considerable. Spiral holders dispense with this constantly-recurring cost, for the shell only needs painting; and this can be done from the top of the tank—thus avoiding any risk on the part of the workmen, and ensuring that the parts are properly covered with the material. Furthermore, when a spiral holder is out of action, there is no superstructure above the ground, which is necessary with an ordinary holder. This, in some busy districts, is a disadvantage to the inhabitants; for, though the holder itself may not be required, the superstructure must remain, and interfere with their view.

The cost of the new holder and tank has worked out at a little over £8 per 1000 cubic feet, which may be regarded as a record price for a holder of 1 million cubic feet capacity. The tank, which is of brick, set in cement mortar with puddle backing, is 118 feet in diameter and 26 feet deep.

The contractor for the tank was the late Mr. John Taylor, of Widnes and Garston, who unfortunately died shortly before the contract was completed.

THE INAUGURATION OF THE HOLDER.

As if to afford testimony of the power of a spiral holder of four lifts to withstand the stress of high winds, something approaching a hurricane set in just about the time appointed for the opening ceremony last Tuesday, at which the Mayoress (Mrs. S. Owens) was to take the central part. During the function she had the support of Mrs. Graham, Mrs. Carr, Miss Owens, and Miss Carr. His Worship the Mayor (Alderman Owens) and the Chairman of the Gas and Water Committee (Alderman Timmis) were accompanied by Mr. Benjamin Brown, formerly the Chairman of the Committee, and several other members of the Corporation. Among the visitors were Alderman Gibson, the Chairman of the Manchester Corporation Gas Committee, Alderman Jennison, also of Manchester, and a number of Mr. Carr's neighbouring gas *confrères*. Mr. Charles Dempster and Mr. J. W. Scott were there to represent Messrs. R. & J. Dempster, Limited.

The party that assembled near the outlet-valve of the holder shortly after noon was a numerous one; and without delay Alderman Timmis invited the Mayoress to start the holder on what it is hoped will be long and excellent service for the town. Of course, it could not be expected that a lady could tug at the wheel of a 24-inch gasholder outlet-valve; and so, by a happy thought, the valve was locked in position by a heavy chain, and the ends of the chain were clasped together by a gold bracelet, composed alternately of fine chain work and four larger connecting links—the latter being symbolic of the number of lifts in the holder. The ends of the bracelet were fastened by a gold padlock with key—the padlock having enamelled upon it the borough coat of arms. It is a beautiful piece of work. The case for the bracelet has a silver plate on the top, on which is inscribed—

BOROUGH OF WIDNES.

To the Mayoress of Widnes, Mrs. OWENS, from the Gas and Water Committee, on the Inauguration of the New and First Four-Lift Spiral-Guided Holder.

Jan. 29, 1907.

The Mayoress unlocked the miniature padlock, released the hand-wheel, and, by the assistance of one of the workmen, gas was soon passing from the holder into the town. The successful starting of the holder was followed by lusty cheering.

On behalf of the Gas and Water Committee, the Chairman asked the Mayoress to accept the bracelet; and he gallantly but ineffectually essayed to fasten it upon Mrs. Owens' wrist. The spirit was willing, but the skill at negotiating such things as bracelets was lamentably weak, and a lady had to complete the work. That was the only failure or deficiency in the whole day's proceedings. The holder having been declared open, the Chairman moved that a vote of thanks be passed to the Mayoress for the part she had so kindly and gracefully taken in the function. The motion was duly seconded, and endorsed with acclamation by those present. On behalf of the Mayoress, His Worship said that Mrs. Owens was most delighted to be associated with the opening of the holder, which, she hoped, would answer all expectations, and be a very useful adjunct to the industry of the town. She also desired that he should express her appreciation of the kindness of the Committee in presenting her with such a very beautiful memento of the occasion.

The visitors then walked round the holder; and in so doing, the wind strengthened the conviction that the holder stands in a very exposed position; but it was standing so firmly and without any visible tremour the trial to which it was being put, that there is every ground for confidence in saying it will withstand any stress that is likely to be brought upon it. The explanation already given as to why Mr. Carr could not increase the diameter of the holder instead of raising the height to obtain the capacity was understood more clearly when the environment of the site was seen. Many details already referred to were inquired into by the gas engineers present; and a point elicited was—and it is due to the contractors to say it—that, when the holder was finished, so well had the work been done, that there were only a few minor leaks in the crown that claimed attention.

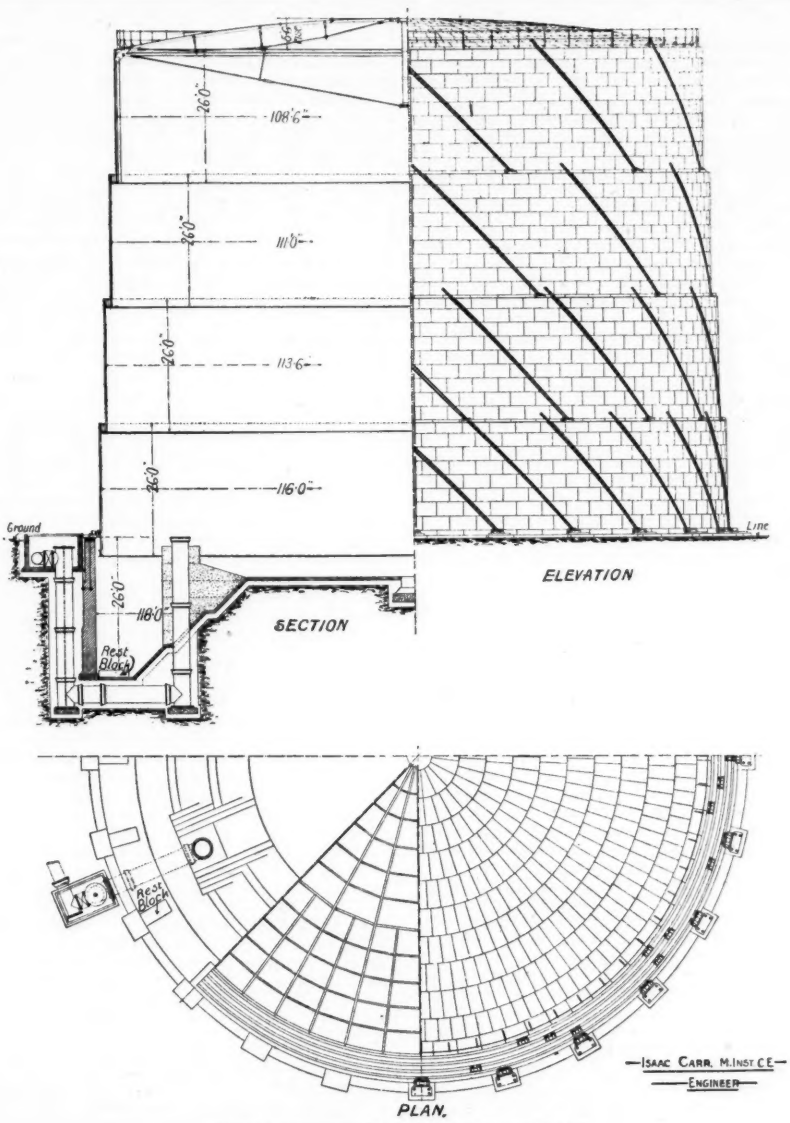
AN INAUGURAL DINNER.

Following the inspection, there was a dinner at the Town Hall to celebrate the event, and subsequently several toasts were proposed.

The loyal toasts having been honoured,

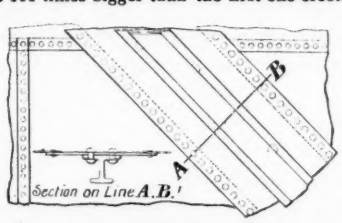
Mr. BROWN, the predecessor of Alderman Timmis in the chair, proposed "The Gas and Water Committee." He said some very complimentary things about the work of the Committee and their Engineer, and observed that he believed the success that attended the Committee's work tended largely to increase the manufacturing interests of the town. His impression was there was no other town in the world that got its gas so cheaply as the ordinary and industrial consumers did in Widnes.

Alderman TIMMIS heartily thanked those present for the enthusiastic reception given to the toast. As Chairman, he appreciated very



Widnes Corporation Four-Lift Spiral Gasholder.

much the fact that he had an excellent Committee; for without such a Committee it would be altogether impossible for the Chairman to carry out the schemes placed before them by the Engineer. He reminded those present that it was thirteen years since the Corporation put down the first columnless holder in Widnes. That was then a very great departure, and was largely in the nature of an experiment. It caused a great deal of anxiety at the time, as there seemed to be some risk in departing from all previous types of holders—especially in putting the holder up, as they did, in such an exposed position as on Ditton Marsh. He came to the conclusion then that, if the holder would stand in such a situation, columnless ones would stand anywhere. Therefore they had put the new four-lift holder up without any misgivings whatever. The Committee were perfectly satisfied that it was the right thing and the right principle in gasholder construction. The new holder was 111 times bigger than the first one erected in Widnes.



The Chairman then supplied some of the particulars which have been incorporated in the account we have given as to the past and present history of the gas undertaking. He also referred, with pardonable pride, to the price of gas—mentioning that it was 1s. 3d. and 1s. 1d. per 1000 cubic feet for lighting purposes, and 11d. per 1000 cubic feet for motive power. Despite this low price, they managed to make quite considerable profits, out of which they contributed to the relief of the rates the cost of lighting the town by gas. The sum charged last year against the Department for this purpose was £2000, or equal to 1·65d. per 1000 cubic feet of gas sold. He also alluded to the coincidence that, in that morning's "Daily Telegraph," there appeared a leading article alluding to the fact that the first gas-lamps were lighted in Pall Mall the previous evening 100 years before.

Mr. BULLOUGH submitted the toast of "The Contractors." He regretted that Mr. Taylor, the Contractor for the tank, had passed away. Subsequent remarks showed how greatly he admired the principle on which the holder was constructed. With regard to Messrs. R. & J. Dempster, they appeared to have done their work remarkably well; and it was a credit to them.

THE DEVELOPMENT OF THE SPIRAL-GUIDED HOLDER.

Mr. J. W. SCOTT (on behalf of Messrs. R. & J. Dempster) responded, and made a most interesting speech on the development of the spiral-guided holder. In the first place, he also expressed his sorrow that Mr. Taylor, the Contractor for the tank, had passed away. But this he could say, that the tank and the part of the work that Messrs. Dempster had to do with fell together splendidly. He had been associated with the construction of spiral-guided holders since their inception; and therefore some remarks from him on the subject might be of interest. Owing to the very elaborate character of the framing of ordinary holders that had been reached before the introduction of spiral guides, it was a difficult matter to persuade an engineer that such a vessel could be constructed stripped of all its elaborate trimmings. However, thanks to progressive engineers of the type Widnes possessed, the system became established; and, like all other new ideas, it had progressed with the times. Originally all the guide-rails were fixed internally. But, being inaccessible, they were on the first Widnes holder secured to the outside; and in either case difficulties were presented in attaching the strong rails to the light sheeting. In the gasholder the Mayoress had inaugurated that day, a strong plate was fixed directly behind the guides, and the rails were firmly secured to it. This was considered a great improvement in many ways; but as proving the soundness of the invention, the first gasholder erected on the spiral principle at Northwich, under the supervision of Mr. T. Newbigging, had never once been out of action. Further improvements were embodied in the Widnes contract, for the side plates were extended above the top curb, so as to collect the water or other deposit that formed on the crowns of gasholders in all manufacturing districts, and direct it down the spiral rails—thus preserving the paint on the sides and preventing disfigurement. Mr. Carr entrusted to the firm he (Mr. Scott) represented the order for a three-lift holder in 1893. At the time that was the largest holder on the system. They had now completed the first four-lift gasholder, so Mr. Carr still held the record; and had he not decided upon a spiral, his storage would have been considerably

less, owing to the exigencies of the situation. The saving in cost was not only upon the holder, but also upon the tank, which in large holders was far more easily constructed, and much less brickwork in proportion was required. An annual saving was effected in the cost of painting; for, in a locality such as Widnes, all exposed superstructures must suffer, and it was a very dangerous and costly matter to properly scrape, scale, and paint the intricate steelwork that even such a gasholder as this would require. The gasholder was fixed in the centre of a busy district, but it would only monopolize the view so high as it might be inflated. This was to many an important factor; for, if an ordinary framed holder had been fixed, even if the vessel was out of action, the superstructure would have been there, blotting out the view. Many works could throw their holders out of action during the summer; so if this one could be spared, it would rest in the tank unobserved. It had become the custom where spirals had been erected, in the event of a rough night, to turn them on the town; for they were the steadiest under all conditions, and were free from even the influences of the snowload such as, during Christmas week, wrecked an ordinary gasholder and damaged others even in Lancashire. There was a very large gasholder in this country that was intended to be an example of the length to which gas storage could be carried. It was found, however, that it was impossible to work the inner lift alone, and risky to uncup the second, for the lifts were too shallow for the diameter, although they were 30 feet deep. They could construct a spiral holder 500 feet diameter, and only 2 feet deep, and yet have entire control. Hence for large holders, the spiral opened out possibilities hitherto unknown. It was an all-British "job" right from the patentee. Mr. Gadd was a Manchester man, and they admired him. The improvement patents were by Manchester men; and the material was all British. Upwards of 200 of the holders were at work; and so long as Messrs. Dempster controlled the patents, they would assure themselves that spiral holders were synonymous with safety. The ratepayers, he felt sure, would agree with their Engineer that they had a safe and sound investment in the new holder; and Mr. Carr claimed another record to the long line he had already made.

Electricity Consumers Benefit from the Gas Profits.

Alderman Gibson, the Chairman of the Manchester Corporation Gas Committee, in proposing the toast of "The Engineer," said it afforded him great pleasure to be present there that day, not only to pay his respects to the Borough and to the Mayor, but also to their Engineer, who had unfortunately got a reputation. He (Alderman Gibson) was pleased to hear of the progress made by the gas undertaking in Widnes; and his Worship would be equally pleased to hear that in Manchester they had made progress quite equal to Widnes. When he came to Widnes, he felt himself rather a great man—a *persona grata*—for he had been Chairman of his Gas Committee for twelve years. On this he flattered himself a little bit; but he found that Alderman Timmis had been Chairman from thirteen to fourteen years. However, it seemed a very strange thing to him, and probably more so to him than to those who administered the gas affairs of Widnes, that, in spite of Mond gas, suction gas, and electricity, still the Manchester gas undertaking had increased year by year; and this last year they had done a much larger business than they had ever done before, in spite of the great opposition that had been offered to them—an opposition that he thought in some cases was a little unfair. Their electricity was supplied by the same funds as the gas; but the Gas Department were compelled to take a thousand pounds a week out of their profits for the purpose of giving it to the rates. The Electricity Committee did not give anything at all to the rates. This he conceived to be very unfair competition, because not only did they not contribute to the rates, but they were allowed to sell their product at any price they liked, and in some cases for less than they could produce it. He held that it was quite unfair that they should put their hands in the pockets of the gas consumers, *nolens volens*, and take out thousands of pounds a year, and give it to other people. He went to the trouble a short time ago to take out the names of 21 large ratepayers in Manchester none of whom consumed gas, but all of whom consumed electricity; and yet they put their hands into the pockets of the gas consumers, and of the total sum taken transferred £1114 a year into the pockets of these particular electricity consumers. He repeated that this was unfair and unjust; and they had no right to do anything of the kind. They had a right to sell their commodity on the best terms—the lowest possible price that they could—without any consideration for anybody else. They should use every effort to do all they could to oblige, to accommodate, and to satisfy their own consumers. In his younger days, he was very anxious to have everything as near perfection as possible; but since he had got older, he was perfectly satisfied with success. He did not care so much now for aiming at perfection; but he did like success. And in business the greatest success was to be achieved by doing the best one could for his customers. The greatest trouble came upon the poorer class of the people, who were suffering because they were charging them for gas 4d. per 1000 cubic feet more than, under other circumstances, they would need to do. When the gas department contributed to the rates, they were benefiting the rich, who, if they had to pay 3d. more upon the rates, would be pounds a year in pocket if they had to pay 3d. more on the price of gas. In Manchester their gas operations were on a very large scale. They carbonized about 500,000 tons of coal a year. They were now speaking of building a new gasholder. While he believed in spiral-guided holders, he did not know how he should look upon one of 10 million cubic feet capacity, which was the size they were proposing now to erect. He had a personal acquaintance with Mr. Gadd; and it was a great number of years ago when he had some serious conversation with him on the subject of spiral guiding. He was glad Mr. Gadd had been successful. Alderman Timmis had spoken of the centenary of a most interesting event in the history of gas lighting. He (Alderman Gibson) always took credit for Manchester, as being the first city that ever secured parliamentary powers to enable them to supply gas for lighting purposes. This was something of which they had reason to be proud; and he had also thought that the first gas-lamp was lighted in King Street, Manchester, about that time. Respecting the toast of "The Engineer," he did not know that he ought to be expected to speak in the most friendly terms of Mr. Carr. He (Alderman Gibson) often had to meet the inquiry, "Why cannot you produce gas in Manchester as cheaply as Widnes? With all your resources in Manchester, you ought to do as well as Widnes." He had said the answer was very simple. There was only one Carr; and he was in Widnes, and that was about the history of the whole thing. He believed that Mr. Carr was a great economist; and he did not suppose Mr. Carr would spend a penny on the gas-works when he could do quite as well with a ½d. That was very creditable to Mr. Carr. He had the greatest pleasure in congratulating him upon the reputation he had attained, and the Corporation upon having him.

Results of Economy.

Mr. Carr, in replying, said he was exceedingly obliged for the kind words that had been used respecting the work that he had carried out, and to those present for the cordial way in which they had responded to the toast. The work at Widnes, he need not tell them, was one that he had deeply at heart; but his work would not have achieved the success it had done if it had not been for the excellent Committees that he had had from time to time. He had been fortunate in winning and keeping their confidence. The proposals he had put before them from time to time they had accepted, and had given him an absolutely free hand in carrying them out, both in the gas and the water works. They had the result of the confidence of the Committee in the unparalleled positions of the undertakings that day. When he came to Widnes nearly a quarter of a century ago—a quarter of a century on the 1st of November next—both the gas and water undertakings were charging very excessive prices for their commodities, and also (to put the point mildly) they were overcapitalized. The capital at that time amounted to between £800 and £900 per million cubic feet of gas sold. "Enterprise" had since been their watchword. The gas consumption was 60 millions at the time of his appointment; it would this year be 320 millions. The old works had disappeared; new ones had taken their place. And as Alderman Gibson had said, the extensions had been carried out, with of course due regard for efficiency—certainly without spending 1d. where ½d. would suffice. With regard to the new holder, he should have liked to have made it of larger diameter. He wanted a million cubic feet holder; but local conditions prohibited him obtaining that by having a gasholder of larger diameter. However, as an old friend of his used to say "There is no charge for going up higher." He (Mr. Carr) thought this was the way out of the difficulty, and of obtaining the million cubic feet holder that he desired. When he looked at the costs of their most recent holders, the cost of the first large one that they built—of 400,000 cubic feet capacity—worked out to £18 12s. per 1000 cubic feet. He did not consider this was an excessive price for a holder of that size. Then they erected the spiral-guided holder at Ditton, which was the first three-lift spiral ever erected, and that worked out to £11 per 1000 cubic feet. In the present four-lift spiral, they had established a record, for the cost was equal to £8 per 1000 cubic feet. Not only did they save in capital cost, but they had an annual saving in the expenditure required for maintaining external guide-framing. Before the acceptance of the tender for the spiral-guided holder, he designed a steel framing that it would have been a delightful thing for him to have seen standing, a monument for all time, to his work. They obtained tenders for the externally guided holder, and for a columnless one. The price for the externally guided holder was £1 per 1000 cubic feet capacity more than the columnless one. He (Mr. Carr) put his vanity in his pocket, as he saw that the right thing to do was to accept the cheaper holder. He was perfectly certain that day it was not only the cheaper but the safer. With his experience extending over such a long period with this class of holder, he believed the spiral form of guiding gave them as strong a structure as, or even stronger than, an externally guided holder. Mishaps had frequently been heard of in connection with externally guided holders; but he had yet to hear of the first accident with a spirally guided one. The late Mr. John Taylor, the contractor for the tank, had carried out his work up to the time of his death with his characteristic excellence; and he (Mr. Carr) shared the regret with many others that he was not present that day to witness the satisfactory completion of his work. The contractors for the holder (Messrs R. & J. Dempster, Limited) had also carried out their work in an exceedingly satisfactory manner. He had never, in the whole course of his experience, been associated with the erection of a gasholder where the work, from the outset to the testing, had proved so thoroughly sound and true.

The Mayor proposed "The Visitors;" and Mr. Edward Allen (of Liverpool) and Alderman Jennison (of Manchester) responded. "The Health of the Mayor" was also heartily drunk, at the instance of Alderman Quinn.

Analyses of British Coals and Coke.—Those of our readers who see the "Colliery Guardian" will probably remember that a feature of its pages during 1902 and the following years was a collection of analyses of British coal and coke. The articles aroused so much interest that it was deemed advisable to enlarge their scope, and to compile a work which would not only be worthy of the importance of the subject, but would contain, in addition to the analyses themselves, information upon the classification of coals, the interpretation of analyses, and the characteristics of the coal seams worked in the British Isles. The idea was carried out, and the result has been the production of a volume of "Analyses of British Coals and Coke," a copy of which we have received from the publishers, the Chichester Press. It contains upwards of 1000 analyses, occupying 444 quarto pages (7 in. by 9½ in.); and the particulars are arranged so as to allow for marginal notes. They are compiled by Mr. Allan Greenwell, F.G.S., Assoc.M.Inst.C.E., the Editor of the "Colliery Guardian," and Mr. J. V. Elsden, F.G.S., B.Sc.; and they are preceded by an introduction by Mr. Clarence A. Seyler, B.Sc., F.I.C. dealing with the first two of the additional subjects above named. The analyses are accompanied by commercial indexes and a map, and form a valuable collection.

MIDLAND JUNIOR GAS ASSOCIATION.

The February Meeting of the Midland Junior Gas Engineering Association was held on Saturday, at the City of Birmingham Technical School—Mr. G. W. G. Tatam, the President, in the chair.

Mr. A. N. Comely (Windsor Street) read a paper entitled "Refractory Materials Used in Gas-Works," the principal portions of which are given below—the parts omitted consisting of details of the process of manufacture of fire-bricks and fire-clay goods. Mr. Comely was able to show the members numerous specimens of materials, models of retorts, &c., which had been forwarded by Messrs. George K. Harrison, Limited, of Stourbridge; and in addition to this he sketched on the blackboard a section illustrating the position of the Old Mine seam and some of the New Mine seams of Stourbridge clay.

REFRACTORY MATERIALS USED IN GAS-WORKS.

The chief refractory materials at present used in gas-works are fire-clay and silica. Fire-clay goods are used for the piers and arches of retort-benches; the producer, the retorts, the transverse walls, and the regenerator of regenerative settings; the linings of the generator, carburettor, and superheater of water-gas plants; and the seating blocks, &c., of boiler settings. Silica goods are used in some cases for the lining and arch of the producer, and as a general rule for the whole of the zone of combustion in gaseous-fired settings. In all these places, the importance of good material is obvious; for it is certain that, given the best of designs (say) for a regenerative setting, if it be built with bad material, failure is inevitable.

At this point, it will be well to obtain a clear idea as to what characteristics a good refractory brick should possess; and then when the impurities of clays are dealt with, their influence upon these characteristics will assume its proper importance. The following are the main qualities essential to a good refractory brick: (1) Refractoriness—that is, the capacity of resisting the highest temperature likely to be experienced in the position in which it is to be used, without softening or undue contraction. (2) Toughness—that is, freedom from splitting when exposed to changes of temperature. (3) Density—that is, power to resist pressure due to the weight of superincumbent material.

As to (1), about 1200° C. is the highest working temperature for the best brands of fire-bricks, and about 1700° C. for silica bricks. At temperatures higher than 1200° C., fire-bricks will shrink and soften. This softening is partially due to the pressure of the upper layers of bricks, and to the presence of iron, alkalies, and sulphuric acid in the dust and vapours from the fuel reacting upon the softening brick, and promoting fusion. Thus, as is well known, nostrils and passages become closed up. Analyses of various fluxed portions showed in one instance upwards of 30 per cent. of iron; while the flue ash contained 47 per cent. of iron and 33 per cent. of sulphuric acid. Silica bricks are not affected in this way to the same extent; but as to (2)—*i.e.*, toughness—they are more likely to split, unless the "bond" of the brick is particularly good, and great care is taken in raising and lowering the heats. With regard to (3)—that is, density—the crushing weight of an ordinary fire-brick is from 600 to 1000 lbs.; but some of the best brands will stand 3000 lbs.

Bricks for carburettors and superheaters of water-gas plants, though not required to be very refractory, need to have this characteristic in particular—viz., freedom from oxide of iron. The reason is that the hydrogen and carbon monoxide in the crude water gas exert a powerful reducing action on any iron, manganese, or their oxides present in the bricks; free carbon being deposited in the pores of the material. In time, disintegration results; rendering frequent renewals necessary. For instance, at one large works 25 per cent. of the chequer-bricks in the carburettor were rendered useless after only 16 weeks' work.

Clay is not by any means a definite substance; and the term includes a number of materials of varying composition, as well as of different origin and different modes of formation. The purest clay is kaolin or china-clay. It is white, and was probably formed by the decomposition of felspars, and the washing away of their alkalies—soda and potash.

Fire-clay represents, no doubt, an ancient soil, and has lost its alkalies to the vegetation which grew upon it in that remote period. In no place is the evidence in favour of this view more abundant and clear than in the Yorkshire coalfield. Descending through the measures, a fire-clay or ganister is found beneath coal after coal, with remarkable regularity. Further, in the underclays it is quite a common thing to find a mass of clay literally crammed with ribbon-shaped markings of the roots of Sigillaroid plants.

All fire-clays as they occur in Nature, are essentially hydrated silicates of alumina, and when pure correspond to the formula Al_2O_3, $2SiO_2$, $2H_2O$. In other words, a pure clay, before burning, should contain: Silica 46·5 per cent., alumina 39·5 per cent., and combined water 14·0 per cent. A clay of this composition would begin to soften at about 1830° C. The nearest approach to purity is found in china-clay, the composition of which varies generally between: Silica 50 to 65 per cent., alumina 25 to 35 per cent., and combined water 10 to 14 per cent. This combined water is a most important constituent, as upon its presence depends the plasticity of clays. Clays also contain hygroscopic water, which may be driven out by heating at 100° C., without lessening their plasticity; but if heated to redness, both the hygroscopic and the combined water are expelled, and the clay ceases to be plastic. Other things being equal then, a fire-clay which has (say) 8 per cent. of combined water, will be more plastic, and the finished article will have greater tenacity or "bond" than one having only (say) 5 per cent.

The silica in clays may exist in three forms, as shown by the analyses of four clays given below:—

—	No. 1.	No. 2.	No. 3.	No. 4.
Silica, free, as sand	56·95	47·40	29·63	16·20
,, combined with bases . . .	18·69	26·98	37·74	45·53
,, as hydrate	1·39	1·06	0·91	1·05
Total silica	77·03	75·44	68·28	62·78

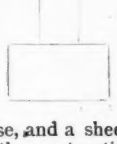
The free silica may be present as sand or in a much finer state of division; and it is to this free silica that the grittiness of a clay is due. The size of the particles of silica, also, has a distinct effect upon the refractory value of a clay. For instance, of two clays, alike in other respects, that which has the greater proportion of coarse particles will be more refractory than the other, and less liable to split if exposed to changes of temperature. The other constituents of fire-clays are best indicated by the following table of analyses:—

Locality.	SiO_2.	Al_2O_3.	KO.	CaO.	MgO.	FeO.	H_2O. Combined.	H_2O. Hygroscopic.
Stourbridge—								
Old mine, best selected . . .	76·85	16·59	0·66	0·10	Trace	0·79	5·01	..
Do., ordinary . .	56·85	26·58	1·68	0·20	0·34	2·35	12·00	..
Dowlais	67 12	21·18	2·02	0·32	0·84	1·85	4·82	1·39
,, ...	53·05	28·13	4·19	0·17	1·20	2·48	5·82	2·20
Glenboig	65·41	30·55	0·65	0·69	0·64	1·70	..	.
Dinas	96·73	1·39	0·20	0·19	..	0·48	0·50	..

From these analyses it will be seen that the chief impurities usually found associated with fire-clays are the alkalies and oxide of iron. The oxide of iron is generally in the form of nodules of clay ironstone. This ironstone is partially oxidized during weathering, and completely so on burning, and is the cause of bricks sometimes being mottled on the surface with dark spots. It lowers the refractory value of a clay to a serious extent by fluxing with the silica, and is therefore most dangerous.

With regard to the above analyses, these points may be noted: No. 1 is a very good refractory clay, with a low percentage of alkalies and iron. No. 2 is about ordinary Stourbridge quality; and, having 12 per cent. of combined water, it would be more plastic, but with its higher proportion of alkalies and iron, it would not be as refractory as No. 1. No. 3 is best Dowlais fire-clay. No. 4 melted down on the bridge of a ball-furnace, and shows plainly the influence of alkalies in promoting the fusibility of a clay. No. 5 is a fire-clay with an excellent reputation. No. 6 is a highly refractory siliceous rock; and on account of the small proportion of combined water, it needs the addition of a fluxing agent—such as lime—to be the necessary binding material in the finished brick.

From the above, it will be noticed that it is possible to indicate the quality of a clay from its chemical constituents. But even when a physical analysis is given in addition, it still needs an actual test by fire to enable a complete judgment to be arrived at. Such a test is made by moulding a sample of the ground clay into the shape shown, and subjecting the piece to a temperature slightly higher than that which the goods will be required to withstand. The edges or arrises should afterwards be carefully examined. If they continue sharp, the clay is refractory; if much rounded, it is an evidence of some incipient fusion. Sample bricks may, of course, be tested in a similar manner; one having sharp edges being selected for the purpose, and a sheet-iron template being cut to fit it exactly, so that the contraction may be accurately measured. A suitable form of experimental furnace for testing clay or bricks in this manner is made by Messrs. Fletcher, Russell, and Co. for use with the oxy-hydrogen flame.



Fire-clay is "mined" in much the same way as coal, and several measures of clay are often found in the same mine—their composition and quality varying one from another often to a remarkable degree, as, indeed, is sometimes the case even when from the same continuous seam. The first stage in the manufacture of fire-clay goods, after the clay has been mined, is that technically known as "weathering." This is a most important stage, and one which has a very definite influence on the quality and refractoriness of the finished goods. It consists in tipping the raw clay out of the small waggons or "tubs" in which it has been raised from the pit, to form long stacks or "banks." Once or twice each day during dry weather the bank is well watered; and after some months the hard lumps of clay become disintegrated and fall to powder. Opinions differ as to the length of time it is necessary that the clay should be exposed; but eighteen months is usually considered as the minimum period desirable.

After weathering, the clay is taken to the grinding mill, where a proportion of burnt stuff, necessary to keep the contraction within reasonable limits, and to make the resultant goods more open, is added. The amount will depend upon the natural plasticity of the clay and the kind of goods to be made—a strong clay allowing of the addition of a much larger quantity than a less plastic clay. As a general rule, for bricks one part of burnt clay or old fire-bricks will be mixed with from three to four parts of raw clay; and for retorts, one part of burnt to two parts of raw.

The various sizes of 9-inch bricks most commonly in demand are made either by hand or machine; and after that comes the drying, which is carried on in sheds. From the time the goods are put on the floor in the "green" state until they are dried "white-hard," and are ready for removing to the kiln, is, in the case of 9 in. by 4½ in. by 2½ in. bricks, about four days, and tiles 16 in. by 14 in. by 2½ in. a matter of about twelve days—on account of the danger of them warping or cracking if the drying be hurried. The bricks, when partially dried, are "fettled" or hand-dressed, and then stamped or marked with the manufacturer's name. Blocks and special bricks of large size, such as are required for water-gas plants, are made in moulds on the floor of the drying-shed itself; and if of great thickness, they require extreme care to avoid cracks and warps.

Retorts are of two kinds—moulded and segmental or tile. The former may be either hand or machine made; while the latter are usually manufactured under a steam or a hand-fly press. The plastic clay from which retorts are to be made usually contains about one-third of old fire-bricks which have been broken up and two-thirds of raw clay; the object of this large proportion of burnt stuff being to lessen the shrinkage, raise the refractory value, and keep the grain of the finished retort as open as possible. The mode of manufacture of hand-moulded retorts, in general use in the Midland district, is that known as the "Newcastle" method. It consists in building-up the length of retort required in short sections or "lifts" of from 14 to 18 inches each. One 6 ft. 8 in. in length takes about 21 days to build; and though there may be objections to this method on account of the number of joints, very good retorts can be turned out. For machine-made retorts, the clay used has to be carefully and evenly tempered. The freedom from joints and the great pressure to which the clay is subjected should theoretically produce retorts far superior to those made by hand; but practically the advantage is not overwhelming. In segmental or tile retorts each retort, in cross section, is built up of a bottom tile and (say) five segments, both the transverse and longitudinal joints being usually rebated. There is considerable difference of opinion as to whether segmental retorts are superior or inferior to moulded ones; the advantages of the former being greater durability and ease in patching and repairing, while their chief disadvantages are the cost of original installation and the great number of joints.

While dealing with the manufacture of retorts, it may be well to add a few remarks upon the question of standard sizes of retorts. The advantages which would follow upon the adoption of some standard sections of retorts of the different forms, are, of course, apparent on the slightest consideration being given to the matter. Gas engineers would obtain their retorts at a lower price, and could set new retorts on shorter notice than is necessary at present. Retort-makers would not need to have their present stock of hundreds of different patterns and templates, and could continue making retorts for stock during the winter months and throughout the whole year at a uniform rate. Under present conditions, makers are very busy during the summer, and slack for the remainder of the year; and, as a consequence, the quality of the finished retorts suffers, and the retorts cost the manufacturer more to make. The question of standardization has been brought forward time after time since 1878; but there has up to now been no definite move in this direction. The Germans, in their love for system and uniformity, took the matter up long ago, and have adopted standard sizes for many years. Whatever may be the method of carbonization in the future, at present, at any rate, we are using retorts; and we appear to be likely to be doing so for the next ten years at least. Therefore this question is still an important one, and needs only a mutual agreement among gas engineers as to the best sections to be adopted as standard ones. Then I think that the makers of retorts and iron mouthpieces would gladly carry out and complete the work of standardization.

The final stage in the manufacture of fire-clay goods is "burning." The goods are burnt in kilns; the operation extending over five to fifteen days, according to the class of goods being burned and other circumstances. With regard to the temperature at which goods are burnt, it is most important that this should be higher than they will be exposed to in the retort-setting; otherwise they are bound to shrink. The final temperature of burning is usually judged by sight and test-pieces; but some makers use Seger's cones or Watson's recorders, and burn to a definite temperature of (say) 1200° C.

Glenboig Fire-Clay Goods.—Though the analysis of Glenboig clay in the table already given does not reveal any very striking difference from that of Stourbridge clay, yet there are several features to be remembered. Glenboig fire-clay contains a high percentage of combined water and a certain proportion of alumina, which causes it to shrink very much in drying and firing; but after having been burnt at a high temperature, the material then suffers much less change of volume by subsequent alterations of temperature. Hence Glenboig bricks practically suffer no expansion by heat or contraction by cooling, and do not crack or split off when subjected to currents of cold air.

Silica Fire-Bricks.—By far the greater number of silica bricks are made from the Dinas rock found in the Vale of Neath, South Wales, and its geological equivalent, ganister, found beneath the coal-seams in the vicinity of Wortley and Sheffield. The analyses below show the similarity in the composition of the two rocks :—

	Dinas.		Ganister.
Silica	98·31	..	96 55
Alumina	0·72	..	1 59
Peroxide of iron	0·18	..	0·71
Lime	0·22	..	0·18
Potash and soda	0·14	..	0·53
Combined water	0·35	..	0·85
Total	99·92	..	100·41

These sandstones have undoubtedly been deposited by water; and from the nature of their mineral constituents, it is fairly certain they have been derived from the waste of some granitic rock. The Dinas material occurs in the state of rock and also disintegrated like sand. Samples of bricks made from it, according to Dr. F. Leisse, Chemist at the Cologne Gas-Works, when heated to 1700° C. for fourteen days, expanded lineally from 0·9 to 3·4 per cent. This expansion is somewhat of an objectionable feature, as the bricks have to be loosely set, when being built in the setting, so as to allow them "breathing room." Otherwise, as in one installation of inclined retorts which came under my notice, the middle retorts may be 3 inches higher at the centre than at the ends, due to the expansion of the silica blocks of the combustion chamber. On the Continent, settings have been constructed of Dinas bricks; and it has been found that they will stand letting down and re-firing many times without settling. Also the action of the dust and furnace gases, which are so destructive to fire-bricks when they begin to soften, do not affect Dinas material. Further, Dinas settings, when being heated up, do not show dull zones corresponding to the positions of the cross-supporting walls, as are observed in the case of ordinary fire-brick settings under similar conditions. This points to Dinas material being a better conductor of heat; and the result of a large number of tests shows that, on the average, Dinas goods have 20 per cent. better conductivity than fire-bricks rich in alumina and of fine grain. Of course, bricks made from such granitic material, necessitating it being broken before it can be ground, are as a consequence very costly to make; and this is, so far as I am aware, their only disadvantage. The price of 9 in. by 4½ in. by 2½ in. bricks, f.o.r. Neath, is, roughly, 35 per cent. greater than that of fire-bricks f.o.r. Stourbridge.

Ewell Bricks.—These bricks are made at Ewell, Surrey, and at Chalfont St. Peter's, Buckinghamshire. Their composition is indicated by the following analysis :—

Silica	84·65
Alumina	8·85
Lime	1·90
Magnesia	0·35
Oxide of iron	4·25

They are red in colour, due no doubt to the amount of iron present. They are extremely soft, and can be readily sawn or rubbed down to shape; but they break easily and require handling with great care. They are considered by some engineers to be fairly refractory; but my personal experience of them has not been altogether satisfactory.

Finally, as to the design of fire-clay bricks, blocks, &c. When designing special bricks or blocks for regenerative settings or water-gas plants, it would be well, in my opinion, if the engineer would try to avoid all sudden changes of section or thickness of material, and all sharp internal angles, wherever possible—in fact, to design the blocks as though they were to be made of cast iron, instead of fire-clay, and therefore to round the corners of all openings in tiles, &c. If special blocks are also required to be made in the shortest possible time, then the thickness should be arranged to be not more than 4½ inches or thereabouts, because, if more, the blocks would take a much longer time to dry; and if any attempt be made to hurry this drying, cracks and defective blocks are the consequence. As examples of the length of time necessary for producing good sound bricks, I may say that 9 in. by 4½ in. by 2½ in. bricks need four days for drying, four days' steaming, and seven days for burning and cooling. Tiles 16 in. by 14 in. by 2½ in. require ten days for drying, ten days' steaming, and seven days for burning and cooling.

Discussion.

Mr. I. A. MOBBERLEY (Messrs. George K. Harrison, Limited, of Stourbridge), called upon by the President, said he must congratulate Mr. Comely on his very able and instructive paper. There were one or two points touched upon to which he would like to refer as a manufacturer. First among these was the question of standard sizes of retorts. If gas engineers could mutually arrange standard sizes, he thought it would be both to their benefit and to that of the manufacturers; for, as Mr. Comely told them in his paper, at a certain period of the year the makers were very busy, and during another part they were quiet. If standard sizes were in vogue, these could be made and stocked, and then would be available for drawing upon when wanted. Besides this, the retorts might be made better, owing to there being no need for rushing them. Time was a very important

matter indeed in the fire-brick trade; and he could assure the members that occasionally the manufacturers had a time-limit put upon them which was very unreasonable. He hoped therefore that gas engineers would take this matter into consideration. Then Mr. Comely made some remarks about the Old Mine clay in the Stourbridge district coming to an end. He (the speaker) did not agree with this; for his own firm, at any rate, had got sufficient Old Mine clay to last another fifty years. Personally, his experience was that wire-cut bricks were very much better than other machine-made ones, as there was a rougher surface, to which mortar would better adhere.

Mr. F. J. Bywater (Saltley) also thought that congratulations were due to Mr. Comely, not only on the merits of his paper, but because of the fact that there was really existing at the present time no treatise that dealt with the manufacture of fire-bricks from the practical point of view. He did not know of any such book published in England. It was a most interesting subject, and also a most important one to gas engineers, because they all knew the old adage that dividends were either made or lost in the retort-house; and it was certain that if they did not have a proper furnace, and a tight vessel in which to carbonize and distil the coal, they could not possibly obtain satisfactory results. The amount of scientific study given to the matters dealt with in the paper had been so limited until quite recent years, that there were very few works indeed where bricks were made except by rule-of-thumb. A manufacturer knew that for certain classes of goods what was called a strong clay, or a highly siliceous clay, might be suitable; that for other kinds a mild clay might be used; while for some purposes a judicious mixture of the two might be better. By "judicious," he meant that the manufacturer had to exercise his judgment; and there came in the question of skill. Beyond this, very little was known. The reason why these clays were mixed was not known from a scientific point of view. But now things were on a very much better footing; and in Germany, he thought, there was a lot of valuable research work being carried out. The material that was of most interest to them in the Midlands was that known as Stourbridge clay; and there were several seams of this. The one that had made Stourbridge clay famous all over the world was the Old Mine seam, which was always found under coal, but at varying depths.

Mr. Mobberley remarked that the average depth was about 43 feet.

Mr. Bywater (continuing) said that even the Old Mine seam was not of constant composition. The top of the seam was generally very siliceous; while the bottom was usually mild. The top would, he supposed, contain 70 per cent. of silica, and the clay from the bottom about 50 per cent.; and, of course, the manufacturer mixed them together to get just what he wanted. Besides this Old Mine seam, Mr. Comely had shown them the position of some of the New Mine seams, none of which, however, were so good as the Old Mine. There were a good many of the New Mine seams; and he had seen some very fair bricks made from Seams Nos. 1 and 2; but Seams Nos. 3, 4, and 5 were of very little use except in rare instances. As to identifying from which seam one's bricks were being made, this was a very difficult matter indeed, and required a great amount of practical acquaintance with fire-brick manufacture. There was one thing which might possibly help in this direction—he believed that black Stourbridge clay generally lay with the Old Mine seam. But, of course, one was apt to get a black material which one thought was black clay, and highly refractory, but which might be merely organic matter. Certainly, unless one possessed very special knowledge on the subject, the best thing undoubtedly was to put oneself in the hands of a fire-brick manufacturer who had a good reputation to sustain. The buying of fire-bricks should not be made a mere matter of £ *s. d.* This was a fatal mistake, and caused a lot of trouble. But even after exercising the greatest care, one might possibly go astray, inasmuch as there were firms whose Old Mine seam had been used up, and who had not taken the precaution of buying fresh fields in order to keep up their supply. Then, again, he would advise them never to buy clay from anyone who had not a good stock weathering. In the case of New Mine clay especially, the bricks must be well weathered. The weathering was most important. As regarded the analyses, he did not think the combined alkalies should be more than 2 per cent., while the iron should not be more than 3 per cent., though some clays contained as much as 5 to 6 per cent. of iron, and were fairly refractory, because the alumina was high. This was the case with Glenboig. It was therefore not always dangerous to have a high percentage of iron, if there was not a high percentage of silica—this was what brought it down. If there were impurities or alkalies in the bricks, it could generally be found out if they were well burnt. The iron was reduced in the process of burning. First it became red. They could sometimes, if they broke a fire-brick through, see small red nodules—quite pinky. They were all iron; and if the process of burning was carried to a higher temperature, these all became a vitreous mass. Good fire-brick nearly always contained specks of iron; and by burning well, these generally came out. He did not think it was desirable, as Mr. Comely had said, to build the producer arch of silica. He had seen several so constructed; but they had never been satisfactory. The great thing with silica was that they had to keep the temperature constant; and this could not always be ensured with a producer arch. He would be interested to see the setting built of silica that Mr. Comely mentioned; but he had his doubts as to its general utility. When the heats had been raised and lowered several times, it was apt to crack. In the matter of wire-cut bricks, he did not altogether agree with Mr. Mobberley, although he had seen many good ones. They were liable to split. They had to be of a very fine grain; and this being so, one could not get the open texture which he regarded as necessary to the refractoriness of a brick. For arches or walls and places where splitting could not take place, they were, of course, useful. As to the life of segmental retorts, he did not think there was so much diversity of opinion as Mr. Comely would have them believe. He understood it to be an undoubted fact that segmental retorts lasted nearly double the time that a moulded retort did. The life of the latter was from 700 to 900 days; while that of a segmental retort could certainly be taken as 1400 or 1500 days, if not more. The standardization of retorts was very desirable; but he did not know whether it would ever come about.

Mr. S. T. Smith (Walsall), after remarking that the paper was well worthy of their careful attention, said that Mr. Comely had drawn attention to the method adopted for drying bricks in the course of manufacture; but he hardly thought he had brought out sufficiently the fact that with thick bricks a lot more time was required for drying. He was of opinion that, in constructing a furnace, a drawback to the use of very thick blocks was the uncertainty as to whether they were going to get them thoroughly dried and thoroughly burnt all through. He had seen blocks in a combustion chamber on Mr. Paterson's principle broken up, and they had been black in the centre. This was a condition of affairs that was not wanted in a retort-setting; and it was a thing they could not perhaps solely blame the manufacturer for. Sometimes orders were delayed, and the maker was rushed at the last moment; and the only thing he had to do was to hurry the drying or the burning, which probably meant that the centre of the blocks would not be properly treated. This was a point in favour of using thinner tiles or bricks. Mr. Comely and Mr. Bywater had referred to silica bricks for producer arches. He himself had always understood that silica bricks must not be used anywhere near a furnace. He believed the ashes had a very bad effect on the silica; and he would like to hear some more about the use of Ewell bricks. They certainly stood a good heat; but he thought they failed in respect to the crushing weight. Glenboig bricks, he found, stood the heat; and they also stood firing up and letting down again. He had seen thick blocks of Glenboig that had been in use for seven years, and had not shrunk an inch. This was very well for any fire-brick. Mr. Comely spoke of retorts being either moulded or segmental, and of the method of making them in short lengths. He (Mr. Smith) thought they must not altogether blame the manufacturer if retorts became rough, but must also look to the construction of the setting. A lot depended on whether the retort had sufficient bearing surface. If the cross walls were allowed to be too far apart, the retorts were bound to crack in between. One experienced this more particularly in connection with machine working.

Mr. A. O. Jones (West Bromwich) said Mr. Comely had given them a very exhaustive treatise; and, as Mr. Bywater had remarked, they ought to be much obliged to him for it, because so very little information had been published with reference to fire-clay. To show how small the quantity had been, Mr. Comely had quoted an analysis of Glenboig fire-clay which he (Mr. Jones) thought was originally made in 1875—some 32 years ago—and which had been taken as a standard ever since then. As to the analyses, he should like to ask Mr. Comely, with regard to the comparison between Glenboig and Stourbridge clays, whether they were taken under the same conditions. In one case there was 12 per cent. of combined water, and in the other none; and if the analyses were carried out under the same conditions, this seemed a great difference, and pointed to a very different composition of the clays. As to the standardization of retorts, he thought the main question to decide was whether a certain retort would carbonize effectively a good many different sorts of coal. A retort of a particular section might be suitable for one kind of coal, but unsuitable for another. He thought it was a matter for (say) the Institution of Gas Engineers to make exhaustive inquiries upon, to determine what sort of retort would be suitable for all coals.

The Hon. Secretary (Mr. James Hewett) said there was one point on which he would like information. Mr. Comely dealt with the characteristics of silica and fire-clay; but when he came to density, he simply referred to the crushing weight of fire-bricks. Perhaps he would tell them something about silica under the same test. The point raised by Mr. Jones as to the combined water, struck him (the speaker) at once, because later on in the paper Mr. Comely had referred to the high percentage of combined water in Glenboig fire-clay.

Mr. Comely: The conditions were not the same.

The Hon. Secretary (continuing) remarked that they were getting used to suggestions for the standardizing of retorts; and no doubt it would be a very fine thing if they could carry out some scheme. Mr. Comely said they were likely to be using retorts for the next ten years; and he (Mr. Hewett) did not think many of them would like to start having another section of retorts now, if they had only to last ten years. There was plenty of iron-work in connection with existing retorts which they hoped would last quite as long as this.

Mr. W. S. Smart (Saltley) remarked that, with regard to density, Mr. Comely said: "The crushing weight of an ordinary fire-brick is from 600 to 1000 lbs.; but some of the best brands would

stand 3000 lbs." Was this per square inch, or simply from 600 to 3000 lbs. on the brick itself? Jointing material had not been dealt with in the paper. He supposed the author assumed that the members were aware of the necessity of using jointing material of somewhat similar composition to the bricks themselves; but perhaps it was a point that might be emphasized by Mr. Comely in his reply. In regard to the standardization of retorts, this, as several speakers had remarked, seemed a difficult thing to bring to the front. However, he found in the "JOURNAL OF GAS LIGHTING" an article some three years ago, according to which the aims and objects enumerated by Mr. Comely could be attained in a different manner—that was, by making their retorts and fire-bricks for themselves at the gas-works. A full description was given of a plant which a London Gas Company laid down for making their own materials; and so successful had this been that they contemplated in the future making their own retorts. It was stated that they used 70 per cent. of their old fire-brick material ground up, and only 30 per cent. of new clay which they bought from the makers. This, however, was very different from the proportion Mr. Comely said the manufacturers were in the habit of using—that was to say, only one-third or one-fourth of old material. It seemed from the article that very little capital and very little ability were needed. It was said to be a means of finding employment for retort-house men in the summer months; and if this could be realized in practice, it seemed that some of the larger gas undertakings should follow the example of the Company referred to.

The PRESIDENT said he had one or two observations to make. He was quite in agreement with Mr. Bywater regarding the troubles arising from rule-of-thumb practices controlling such an industry as the one under discussion, especially as the Old Mine seam, upon which the reputation of the Stourbridge brick was built, was to a large extent worked out. The new clays were milder than the old; and "tempering" by the introduction of extraneous matters—*e.g.*, silica sand or highly siliceous clays—was not always practised with success, because the subsequent properties of the brick were so intimately connected with the chemical complexity and physical condition of its constituents, conditions which could not be determined or imitated at ease. The need of weathering for a sufficiently long time had been rightly insisted on, because when one considered that many of the natural silicates from which the "clays" had been developed were with difficulty attacked by strong mineral acids, the necessity of long-continued action of the atmospheric CO_2 and moisture, comparatively weak reagents, by which the more or less complete disintegration and elimination of alkalies was attained, was very evident. Respecting the fusibility of clays and bricks, as already mentioned, much depended on the physical and chemical state of the components; and this was well illustrated by the natural silicate leucite, which had an alkali constituent of 21·5 per cent. K_2O. This was infusible; but a mechanical mixture of the same composition was easily fusible. Then, again, manufacturers often said that there really was little or no research work being done, and what was being carried out was useless, because it might not give exactly the information required. For instance, there was an immense difficulty in distinguishing between the various classes of these silicates. Judged from their composition, some of them would be thrown out and others retained; but often those thrown out, on this basis, were better than those retained. Therefore the chemical side was rather in the dark. There had been work done; but more was required. With regard to the firing-test, in the firing of goods in a small furnace, the conditions were altogether different from those existing in an ordinary setting—that was to say, with reference to the action of the gases, &c. If they were burning coke, they had sulphurous gases and iron dust, and suchlike, going into the settings, and being deposited on the bricks and causing fusion. Therefore they might get in a small test-furnace a brick that would stand perfectly well, but which when placed in an ordinary setting would not. Therefore it seemed to him that by placing a brick in the combustion chamber and raising it to a high temperature, one did better than by having a small furnace. Mr. Comely seemed to infer that silica brick was not troubled by the flue ashes (the most important constituent of which was iron) and the action of gases. But he (the President) could assure him that silica bricks were very sensitive to the action of iron. For instance, taking a Stourbridge brick that was rich in iron, and putting it on the top of the combustion chamber, he had found frequently that the silica had fused right away where it had been in contact with the ordinary Stourbridge brick. He thought at first this was due to the binding material of which the joint was made; but he discovered in one case that there was no joint, the bricks having been merely placed end on end with nothing at all between them. The silica had run down like a piece of glass—it was not transparent, but was going on that way—so that he did not agree that silica brick was unaffected by iron to the extent that Mr. Comely said was the case. Of course, weathering was very important; and this could not be carried on too long. The more frost, too, they could get on the bricks the better, because it broke the material; and they all knew that, the finer the material, the more energetic was the action of reagents upon it. Mr. Comely said that his personal experience of Ewell bricks had not been very satisfactory. Most gas managers seemed to have been unfortunate in this respect in the Midlands; but in the South, when he was there, everyone swore by Ewell brick. It was soft; but the settings built of it had been very satisfactory indeed. One of its characteristics was that the longer it burnt the harder it became. It seemed to be a brick that could never be used up. If one got a good Ewell brick, one could not hurt it with any temperature that was encountered in gas manufacture. But some bad results had been obtained owing to some of the material having been improperly washed. There was a clay which should be taken out of the material; and on this occasion some plums of it were left in. His experience of Ewell bricks had been extensive; and everyone he had come across in the South had also spoken very highly of them, with the exception of the few truck-loads of which he had spoken. He had seen settings pulled out in which not only was the combustion arch and all the combustion chamber built of Ewell brick, but the producer was lined with it above the clinkering zone; and it was found to have lasted exceedingly well. The liability to flux was not great with Ewell bricks; they had had very little trouble from this. After all there was something to be said for a standard section of retort, if gas managers in general could be brought to it; but everybody had his fancies, and a man naturally thought more of his own ideas than of other people's. There was one point he would like to mention with regard to the melting-points of alumina and silica. It seemed very strange that these two materials when mixed together became more fusible than either was when apart. The lowest point was where one had 1 molecule of alumina to about 17 molecules of silica. Thus it did not follow that, because two substances had a very high melting-point, when they were put together one was going to get a melting-point intermediate between the two. He concluded by proposing that a hearty vote of thanks should be accorded to Mr. Comely for his paper; and in doing so, he associated himself with the remarks as to the great value of the paper which had been made by previous speakers.

Mr. J. H. WILLOUGHBY (Leamington), in seconding the vote, referred to the question of standardization, and said he believed that certain makers at the present time recognized certain sizes and shapes of retorts as standards, and manufactured in advance; otherwise they would not always be able to meet demands made upon them. As to refractory materials, there was no getting away from the fact that in a modern regenerative furnace there was a large amount of heat concentrated on a small space; and it was always necessary to get the best material possible to line that space. He differed from Mr. Comely with regard to Ewell bricks; for at his works they had obtained their best results from them. They had tried ganister and other similar bricks; and their arches had generally gone. At the present time they had Ewell arches which had worked 900 or 1000 days, and were still in use. His experience had been the same as that of the President—that the longer they burnt the harder they became. With reference to heats, he was of the opinion that the gas manager of to-day was apt to neglect taking his temperatures as he ought to do. He trusted to his own eyesight too much. One could not say exactly what the temperature was unless there was a system adopted of taking it. Pyrometers were rather difficult to manage at the back of a retort; but with the aid of Watson's heat recorders they had ascertained the temperature at his works, and found it was higher than they had thought.

Mr. COMELY, in reply, said it would need a paper twice as long as the one he had given to deal with the discussion properly. As to settings made entirely of Dinas material, he was largely quoting from authority, as he had not had much personal experience. Dr. Leisse, the Chemist of the Cologne Gas-Works, said he constructed a trial setting of Dinas material, and obtained such good results that in the following year ten beds of seven and two of nine retorts were built with these bricks.

Mr. BYWATER said he did not dispute that they would stand. His point was that with firing up and letting down they might crack in places that could not be reached.

Mr. COMELY (continuing) remarked that he had stated that when bricks and blocks were of great thickness they required longer to dry. As to Ewell bricks, he could give some results of experience. One firm of contractors, out of five cases in which they used Ewell bricks, had three in which they failed absolutely. In one instance, in some settings erected by another firm of contractors, the Ewell bricks had failed before the retorts were hot. The makers said that when once the bricks had vitrified they would stand. He quite agreed with this; and many people had been fortunate enough to obtain good Ewell bricks. But he did not think any gas manager could afford to run the risk of three settings out of five failing. In Birmingham, also, he believed the experience had been unfavourable. The analyses were taken under different conditions. In one case it was a dry sample, and in the others a piece of raw clay. The analyses of raw clay were recent ones—taken five or six weeks ago.

Mr. JONES: It seems a pity to put them together, as though they are comparable.

Mr. COMELY said he meant to ment ion that the Glenboig was a dry sample. After all was said and done, if a chemical and physical analysis had been made, with their present knowledge of the subject he still thought they needed the fire test to come to a final decision, because the whole question was so complex that until they knew very much more about the composition of refractory substances it was difficult, and in most cases dangerous, to speak definitely at all. With regard to the small furnace for testing samples, he should quite agree that a test in a retort-setting was preferable, and would suggest that the two would be better still. In conclusion, he thanked them all very much for the extremely kind manner in which they had received his paper.

SCOTTISH JUNIOR GAS ASSOCIATION.

Eastern District Visit Glenboig Fire-Clay Works.

The members of the Eastern District of the Scottish Junior Gas Association, to the number of nearly thirty, paid a visit on Saturday to the works of the Glenboig Fire-Clay Company, Limited. The main body travelled from Edinburgh, and on arrival were received by Mr. John Douglas, one of the principal officials of the Company. Small parties were made up, and were conducted through the Star and the Old Works by Mr. Douglas, Mr. George Johnston, Mr. John Baird, Mr. Robert Reid, Mr. William Baird, Mr. D. M'Mahon, and Mr. R. Blackwood.

There is a pit in the Old Works, 20 fathoms deep; and clay is brought to the works in hutches from three other fields, all then being mixed together. But before anything is done, the clay is subjected to a process of weathering. It is then fed into an ordinary stone-breaker, and passes to the mill, in which it is ground in a dry state. It is next elevated, carried by a conveyor, and deposited at will into any one of a series of hoppers, from which the pan mills, where it is moistened and made ready for moulding, are supplied. From these it is filled into hutches, which are elevated and run along the upper flat to the points where it is delivered to the moulding benches. Almost all the moulding is handwork. The floor of the lower flat is of concrete, under which there is a very close network of small passages, in which live steam is circulated, to provide heat for drying the moulded pieces. The steam supply can be regulated so that pieces of the size of an ordinary fire-brick can be dried in one day. Larger pieces require to be dried more slowly; and these are placed on the upper floor, the heat in which is only that which rises from the flat below. Pieces were seen of cube form, with 24-inch sides, which take weeks to dry. There are numerous kilns, and of various constructions, fired by coal direct and by producer gas. In the latter (the invention of Mr. James Dunnachie, the Managing-Director) the air which is to be used for admixture with the gas, for the heating of the kiln which is being fired at the time, is drawn through those which have been already fired and are cooling down—advantage being thus taken of heat which would be otherwise lost. Again, before a kiln is put under the fierce heat of the firing process, the one which is to be taken next has been filled; and the tail of the flame from the one which is being fired is played into it, by which much of the first, or slow, stage of firing is accomplished by heat which would otherwise pass up the chimney.

The produce of the works is fully 100,000 bricks a day, besides other pieces, among which are, in the Old Works, the making of gas-retorts. Of these, over 5000 are produced annually. The making of one was shown in operation; the retort under construction being, by coincidence, part of a contract for the Granton Gas-Works. In a store were shown the numerous templates for the varied forms and sizes of retorts favoured by individual gas managers. It seemed almost incredible; but the assurance was given that there are over 500 different shapes and sizes of retorts in use in the gas-works supplied from Glenboig. The retorts are necessarily dried where they are built, and are then conveyed—a work of much care—by overhead crane into the special kilns in which they are fired, standing on end.

In the Old Works there is a small gas-works, in which oil gas is made for the illumination of the workshops. These works have been in use for over twenty years, and are not regarded as in any way up to date; but they have the peculiar feature that the oil is carbonized in fire-clay retorts made in the works. These are circular, about 3 feet in length and 10 inches in diameter, with walls 3 inches thick. The residuum left in the retorts is a sort of hard tarry coke, which is valueless. Before leaving the works, the visitors were taken to see an Institute, which the Directors have erected at a cost of about £3000, for the benefit of their workers.

The inspection over, the company were entertained to coffee and other refreshments in the offices, which are housed in a building constructed of the Company's bricks, and of handsome appearance. Mr. Douglas said he was sorry the Managing-Director and Chairman, Mr. Dunnachie, had not been able to be present, having been detained in London. Speaking of the visit, he remarked that he would just like to hint to such of them as might be ordering retorts, in years to come, that, while it was not the business of the Company to dictate to them, he supposed they would have seen that the Company had a large plant, for which, during a part of the year, there was not much doing; and it would be greatly to the advantage of all if this plant could be kept going at a sort of normal rate all the year round. They could thus see the importance of ordering retorts early. He proposed the toast of "Prosperity to the Scottish Junior Gas Association," coupled with the name of Mr. W. Brown, of Lasswade, the President of the Eastern District. This was acknowledged by Mr. Brown, who then asked those present to drink "Prosperity to the Glenboig Union Fire-Clay Company." At the same time he would propose a hearty vote of thanks to Mr. Douglas and the other gentlemen who had placed their services at their disposal that afternoon; and he would ask Mr. Douglas to convey to Mr. Dunnachie, and to the Directors, the thanks of the Association for the provision they had made for them that day. Subsequently Mr. G. Johnston, speaking as the oldest official in the place, said he had much pleasure in welcoming the Association to Glenboig.

GAS-ENGINES FOR MARINE PROPULSION.

At the Meeting of the Manchester Association of Engineers on the 26th ult., a paper on the above subject, considered in its relation to Imperial commerce and defence, was read by Mr. A. Vennell Coster, who is associated with Messrs. Crossley Bros., Limited. The following is an epitome of the paper, which dealt fully with the question, and was illustrated by a large number of diagrams.

The author began by pointing out that marine propulsion by gas is rapidly coming to the front—many leading engineers devoting their attention to it. He therefore thought it would not be out of place for Manchester, which is now one of the largest ports in the United Kingdom, to take up the consideration of the subject. Having reviewed the relative merits of gas reciprocating engines, steam-turbines, and steam reciprocating engines for marine purposes, Mr. Coster said it might be safely assumed, as a rough commercial comparison on the basis of the figures he had submitted, that a gas-engine would turn into actual work about twice as much of the total heat in the coal as the best reciprocating engine or steam-turbine. The fuel consumption with steam plants was from 1·3 lbs. to 1·6 lbs., and with gas plants from 0·65 lb. to 0·8 lb., per I.H.P.; so that either the bunker room might be reduced 50 per cent. or the vessel's radius of action increased 100 per cent. in favour of marine gas propulsion. He claimed the following six advantages for a gas installation: (1) The ship driven with one-half the amount of fuel. (2) Stand-by losses reduced by over 75 per cent. (3) Working pressure confined to the engine cylinders. (4) No boiler-tubes or main steam-pipes to burst, or furnace crowns to collapse. (5) No priming in a heavy seaway, or water-hammer in pipes and cylinders. (6) No more difficulties with the firing of boilers in a beam sea. Gas-producers might, he said, be charged only twice every 24 hours; and the rolling and pitching of the vessel was rather an advantage than otherwise in assisting the fuel down from the charging-hoppers.

Having enumerated the advantages of gas propulsion, the author proceeded to consider the dangers attending it, and the difficulties inherent in the gas-engine. He acknowledged that there are still many difficulties to be faced; but he looked with confidence to their being overcome. The object of his paper was, he said, to put before the members such a scheme of marine propulsion that the most cautious would be willing to risk a voyage by its means. The main difficulties were: (1) The construction of a gas-producer capable of gasifying all grades of bituminous coal. (2) A simple method of cleansing the gas from tar, before the introduction of the fuel into the producer proper, when in the producer, or after the gas had left it on its way to the engine. (3) Perfect control of the gas-propelled vessel in starting, stopping, reversing, and running at all speeds. Dealing with the first and second difficulties, Mr. Coster pointed out that if anthracite coal or coke were used, these would be entirely avoided; but with a limited supply of the former, the wisest course was to leave it altogether out of the question. For marine purposes, they must deal with ordinary bituminous coal, which was cheap compared with either anthracite or coke, and was the only possible fuel for marine gas-producers. Its thermal value varied from 10,000 to 14,000 B.Th.U. per pound; and it cost from 6s. to 7s. per ton. For many years gas-engines had been driven by bituminous coal gas; and the difficulty had always been to get rid of the condensable hydrocarbons, which would fill and clog the valves and gas-passages of any engine they were allowed to enter. This problem was one that must be faced rather by chemists than by engineers; and many notable firms had already solved the problem, but not in the simple manner that would make the gas plant perfectly suitable for marine purposes. It was reported, however, from several trustworthy sources that a simple solution had been discovered. Passing to the third difficulty—that of controlling perfectly a gas-propelled vessel—the author considered in detail all the points bearing upon it.

On the subject of the type of gas-engine to be adopted for marine purposes, Mr. Coster said the simplest was the best; and there was none so simple and so satisfactory as the four-cycle or "Otto" type, with its sequence of suction, compression, power, and exhaust strokes taking place in each cylinder. This type of engine, with inverted vertical cylinders, had a mechanical efficiency of more than 90 per cent., and a thermal efficiency of 33 per cent.; and for a vessel requiring (say) 3000 H.P., units of six single-acting cylinders, with pistons of 21 inches diameter and 24-inch stroke, without piston-rods, stuffing-boxes, or piston water-service, would be suitable. But where larger powers were required, tandem cylinder engines with open cylinder liners, having piston-rod and stuffing-box between the tandem cylinders, where they could be easily inspected and adjusted, would be better. The greatest of all difficulties, however, in the application of gas-engines for marine purposes was the attainment of a sufficient range of mean effective pressures in the cylinders, so that varying speeds could be run without fear of stopping. A solution of the problem had been proposed in a gas-engine built on the Diesel lines; but difficulties attended it. The author had, he believed, arrived at a solution which overcame them all by a practical manipulation of the speeds of independent engine units. By running some of them ahead and some of them astern, any speed

in either direction could be readily attained by the officer in charge of the vessel on the bridge, and without stopping, except during reversal, a single engine, or the normal flow of gas through the producers.

Mr. Coster next went on to review what has been done in the way of propelling vessels by gas power; starting with the *Emil Capitaine*—the first boat fitted for gas—and enumerating the subsequent vessels and their capabilities. He gave some figures, supplied to him by Mr. H. Cherry, of Newcastle, showing the economy of gas plant as compared with steam plant, each of 1400 I.H.P., on 200 days' steaming. In the case of gas, the cost of fuel was £1350; in that of steam, £3375—a difference of £2025; and the weight of the gas plant was only 267 tons, against 373 tons in the other case. Another interesting comparison was made with the *Lord Antrim*, a steamer which the author showed fitted with gas producers and engines; the latter developing the same horse power as the steam-engines, but running at the increased speed of 150 revolutions per minute. Having given some explanatory details of this installation, he concluded by saying that he submitted marine gas propulsion as an alternative to steam propulsion with the greater confidence because gas plants required no funnels and did not emit smoke. There was no serious difficulty in fitting up battleships having from 20,000 to 50,000 I.H.P., seeing that the total plant would have less weight and occupy less space than steam plant of the same power. He emphasized the point that the Navy must be kept up-to-date, and urged the advantages of gas propulsion as a valuable step in the direction of efficiency.

OVOIDAL-MOTION VALVE FOR DRY GAS-METERS

At a Meeting of the Royal Scottish Society of Arts in Edinburgh on Monday last week, Mr. Henry O'Connor, F.R.S.E., submitted a communication prepared by himself and Mr. W. Alexander, in which was described the above-named valve.

In the course of the communication, it was stated that, under very extreme circumstances, such as the breaking of the outlet connections and a high inlet pressure of gas, a dry gas-meter may register more or less than the allowed range when passing considerably more than its nominal quantity, though under ordinary working conditions the meter is quite correct. But with the ovoidal-motion single-valve meter, the rate of working might be varied from 0·5 cubic foot per hour at ½-inch pressure, to an open outlet at 3-inch pressure, when a 3-light meter will be passing 180 cubic feet per hour, or ten times the quantity which the meter is made to pass and register, while the registration will never vary to a greater extent than is permitted according to the Act. Tests of an ordinary two-valve dry gas-meter showed uneven deliveries, owing to the short connecting-rods needed to keep the valves within the compass of the meter case, and also because the valves had to be set at right angles, to avoid the use of a double-throw crank. This position of the valves called for somewhat elaborate passages from the valve-ports to the four chambers into which a dry meter is divided.

In an ordinary dry meter, the gas changes its direction a very large number of times between the inlet and the outlet—in all, an average of 12 per revolution of the meter. It commences in a downward direction with a dead-end, passes horizontally through a side hole in a plate to another dead-end, then upwards through a side hole in a plate to a chamber where the flow is reduced in speed but is horizontal, then downward through the valve, either direct to the case or horizontally along the apron and vertically downward through the tongue into the bellows. After the filling of the case or bellows, the flow is reversed, and passes upwards through the valve from the case, or upwards through the tongue and horizontally through the apron, then upwards through the valve, horizontally under the valve, comes down through the outlet-port of the valve, thence horizontally through the breeks, and finally vertically upward through the outlet-tube. This change of direction is made either 10 or 14 times, or an average of 12 times, during the passage through the meter. When the very small amount of initial pressure available for working the meter is taken into consideration—amounting to only 1·828th lb. per square inch, or say 0·0012 lb. when testing at the usual ½-inch pressure—it will be seen that these various changes of direction must seriously hamper the working of the meter. In the ovoidal valve arrangement, the gas passes down the inlet-pipe to the chamber through a larger hole, then horizontally, and downward through the valve to the case or through the tongue to the bellows—the tongue being so shaped as to cause a gradual and slight change of direction only through the division into the bellows. Returning, after filling the case or bellows, the gas flows upwards through the tongue and ports of the valve horizontally at slower speed under the valve-cover, then down and horizontally through the outlet-port and away to the outlet-tube, where it passes out vertically, or in all only eight changes of direction. This must partly account for the extra quantity of gas passed through the latter type of meter.

The first idea of the second author of the paper was to use a four-port valve and later on a five-port one. Some difficulty was, however, found to get the cycle correct with the latter. After trying all the four ways of connecting up the ports direct to the bellows and the case, it occurred to the first author to connect up two of the ports to the bellows on the opposite side of the division plate; and this proved to be the solution of the difficulty. Now the port farthest from the crank at the hinder side of the meter is connected to a tongue which passes down through the rim of the back bellows, so far like the usual tongue; but this tongue is continued down so as to completely cover a hole in the division-plate through which the gas passes to and from the front bellows—a similar tongue attached to the front port serving in the same way to connect up to the back bellows.

Circular motion or rotary valve meters have been made in the past, in which the cover and grid were over one another—the cover being rotated about the centre of the latter. This gave uneven wear, as the parts near the periphery were subjected to a longer travel than those near the centre. This uneven wear is avoided in the ovoidal valve, as each part in it has practically the same amount of rubbing, and this rubbing is of the same nature and has the same travel as is used by the man in grinding and preparing the valves and covers when making an ordinary meter. This particular motion has been adopted by the grinder as it has been found that it brings up a true and even surface more quickly than any other. Surely, then, this is a movement in the right direction, to make the valve travel in such a way as will tend to wear it evenly, and thereby keep the faces true. If the valves leak, gas passes through the meter without being registered.

It is a well-known fact that the passage of the gas through the narrow spaces between the valves and covers, causes a deposit of some of the hydrocarbons from the gas upon the surfaces of the valves, and this speedily changes to a glutty substance, which at times becomes so hard as to absolutely prevent the movement of the valves. The direct reciprocating movement of the ordinary valve does not appear to have any clearing effect upon this glut; but the angular motion of the edges of the ovoidal valve seem to clear away the deposit as soon as it appears. Experiments made with such glut have proved that the meter works more easily with the newer type of valve. [Mr. O'Connor exhibited a quantity of glutty matter taken from a dry meter which had been only three months in use.]

In conclusion, the authors said a strong point in favour of this form of meter was the ease with which it could be repaired, even when rusted through in such vital parts as the valve-plate or the breeks. In the usual way, such meters were condemned, as the cost of repair was practically the same as that of a new meter; but with this construction, the elaborate passages being dispensed with, such a repair was quite possible at a price which would make it an economical transaction. This type of meter had been tested by the manager of the meter department of one of the largest corporation gas-works in the kingdom, and he reported that the results obtained were excellent. He said: "The meter was tested at 5-10ths of an inch pressure, and from that up to 3 or 4 inches. Again, we passed ½ cubic foot per hour, and then 30 feet per hour through the meter against the holders. We tried shifting the centres on the valve-seats. Your meter withstood all our attempts and efforts to find defects. I really think you have hit the mark this time."

Discussion.

Mr. Proctor spoke of the importance of having something in the way of accurate measurement of gas; and he thought, as Mr. O'Connor referred to the sharp angles in meters, that there must be an immense amount of loss in the volume of gas measured. The meter which Mr. O'Connor had described would, he considered, be a distinct improvement on existing meters. He was astonished at the amount of glut which could be collected in a dry meter.

Mr. Ritchie said there could be no doubt that a gas-meter was a most delicate instrument. Mr. O'Connor had shown them a deposit which had been produced by gas passing through a meter; and if this deposit took place in three months, what would be the condition of a meter which had been in use for (say) ten years, and was still going on measuring gas? He thought there should be a periodical inspection of gas-meters. Mr. O'Connor's invention was an ingenious one. There could be no doubt that a slide-valve moving in a perfectly straight line would cause wear and tear; whereas a valve with an elliptic motion would not.

Mr. J. Davie said the idea involved in this single-valve meter was one upon which he would not care to express an opinion without studying the paper further; but anyone accustomed to gas-meters must welcome anything in the way of a meter which was likely to be a more accurate means of measuring gas. It was a great astonishment to him to see such a collection of stuff taken from a meter which had only been three months in use. Evidently the makers had been determined to oil it well. He did not think the deposit came from the gas they were accustomed to in Edinburgh.

Mr. Reedie knew that there was a good deal of unnecessary suspicion thrown upon the action and registration of dry meters. So far as cleanliness was concerned, he had seen a 50-light dry meter which had been in use for 25 years as clean and in as good order as when it was new. He had had in his hands that day a 2-light dry meter which had been in constant use for 30 years. It was pretty well worn down, but it did not seem to have very much wrong with it, in the inside. The people had perfect confidence in it. The deposit that took place depended chiefly on the quality of the gas. He thought meter makers had a grievance in being required to guarantee meters for five years.

Mr. W. A. Carter sympathized a good deal with what Mr. Davie had said, that they could scarcely enter into an intelligent discussion upon a delicate instrument such as the one before

them unless they had previous knowledge of its mechanism. Mr. O'Connor claimed that his meter produced an equality of action in the way of pressure and supply, and that it presented facility for repair which the two-valve meter did not. The question of equality of pressure and supply was one that had a very large effect upon the present method of gas lighting. The incandescent burner appeared to be peculiarly sensitive to differences in pressure; and if any new meter should be brought into the market which would improve the pressure, and make it more equal, it would be hailed by the public, and would be of great advantage.

Mr. O'Connor, in reply, said he thought they had to consider how they could reduce every cause of friction in a meter, and so make it work as easily and smoothly as possible. With regard to the question of oil, an American recently suggested that the best possible arrangement for a dry meter was to put a pint of mineral oil into it, which would keep the leathers moist. He thought this was quite unnecessary. He had seen a meter which had been in use regularly for 45 years, and which was stamped a few days previously as being a correct measurer at the present time. It had not been opened, as it had not been necessary to touch it. The gas used in the meter to which he had referred did not come from the Edinburgh Gas-Works. The places where deposits were found were probably those where the gas was not properly cleaned and condensed. He was quite in favour of the frequent testing of meters—say, once in five years.

A hearty vote of thanks was accorded to Mr. O'Connor, and the paper was sent to a Committee to be reported upon.

SOME VIEWS FROM AN INCANDESCENT MANTLE FACTORY.

Some idea of the enormous extent of the incandescent gas-mantle business at the present time may be gathered from the fact that the United Chemical Works, Limited—one of the largest establishments of the kind in the world—employ during the season more than 1000 hands, and are able to turn out 200,000 mantles a day. Reckoning 300 working days a year, this would represent an annual production of no less than 60,000,000 mantles. These are, of course, despatched to every part of the world where artificial light is used; the collodionizing of the mantles being so well carried out that it is possible to transport them without damage to such places as South America, Java, Cape Town, New York, and Iceland. The United Chemical Works, it may be remarked, have come into existence by the amalgamation of seven factories, each of which, it is claimed, was already one of the best in this particular trade.

In the "Journal" for Jan. 26, 1904 (p. 209), there was published a very full illustrated description of the new mantle factory in Berlin of the United Chemical Works; and we are to-day giving some further views showing the burning-off arrangements for the different mantles manufactured by the firm—the apparatus employed in which process is protected by a large number of patents. These illustrations do not need any explanation at our hands; for the process of burning-off is by this time as familiar to those interested in the gas industry as is the name by which this particular Company's mantles are known—the "Ino." One of the claims put forward on behalf of these mantles is that only the very best ramie silk is used in the manufacture of the stockings; the strength and the special qualities of the yarn used being the outcome of many years' study. In the chemical washing of the fabrics—which is one of the most important stages in the manufacture of the mantles—the Company make use of a secret process which is known only to a very few trusted persons; while the impregnation of the stockings is also carried out by a method which is kept a strict secret, and which has been devised with the object of bestowing on the mantles the highest illuminating power and the greatest durability attainable.

Burning-Off Room for "C" Mantles.

Burning-Off Machines.

Burning-Off Inverted Mantles.

An Excellent Catalogue.

Quite a sumptuous volume has been produced by the Richmond Gas Stove and Meter Company, Limited, which not only constitutes a complete survey of the Company's extensive range of manufactures, but it is, in truth, a pictorial representation of the great range of the uses of gas for purposes other than lighting in the household, large business establishment, or public institution, and in the smaller of industrial occupations. The book is both interesting and instructive. It impresses upon one how magnificently things have grown in connection with coal gas utilization; and the growth has not yet ceased. The volume contains nine sections; and as there are 250 pages in it, it will be seen that numerous pages are required for each section. The first division comprises gas-cookers of all kinds—the best grades, slot, and Colonial, hot-plates, grillers, boiling burners, smoothing-iron heaters, trade stoves, and crucible furnaces. In the second section are to be found special large cooking apparatus. The third section carries the attention to gas-fires, white-light stoves, &c.; and the fourth, to various kinds of radiators. Fittings and utensils of all kinds find place in the fifth section; and in the sixth are pictured and described ordinary heaters and boilers and greenhouse heaters. The seventh and eighth sections are devoted to dry and wet meters, station meters, main cocks, &c.; and in the ninth section are announcements which the firm's customers will find very useful. The volume is prepared in a style that must gain admiration. It is printed on art paper and well bound. The typographical and illustration work is excellent. The printing is in two colours; but there are also coloured illustrations that have required several printings—one of them as many as fourteen. The very character of the volume will bespeak preservation; for no one would dream of consigning such a meritorious production to the waste-paper basket. There is a special index given to each section; and copies of sections separately have also been prepared for the convenience of those who may need them for future reference.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, Jan. 29.

(*Before Mr. Justice* PARKER.)

In re the Kent County Gaslight and Coke Company, Limited.

This was a petition by J. R. Carmona and others in connection with the above-named Company for a compulsory winding-up order.

Mr. WHINNEY, who appeared for the Company, said he had to ask that the petition might stand over. The Company had filed their evidence as long ago as the 10th of January; and though the Registrar made an order limiting the petitioners to ten days in which to file their evidence, he had only just received an affidavit, and had not had an opportunity of looking at it.

Mr. EUSTACE SMITH, for the petitioners, thought he could not reasonably oppose an adjournment for a week.

His LORDSHIP assented, and suggested that the evidence might be excluded as being out of time.

Mr. SMITH said the affidavit merely exhibited a newspaper report.

Mr. WHINNEY said he should submit that the evidence only of the statutory affidavit in support of a petition was not, under the rules, sufficient where charges of fraud were alleged against directors.

His LORDSHIP said it was also alleged that practically there was no substratum of a Company left.

Mr. WHINNEY replied that this could not be truly said, because the Company were continuing to supply gas to the district.

Mr. JESSEL, K.C. (who appeared with Mr. EUSTACE SMITH), asked for leave to supplement their evidence, if necessary, charging fraud against the Directors.

His LORDSHIP gave leave; and the petition was adjourned for a week.

EMBEZZLEMENT CHARGE AGAINST A GAS MANAGER.

At the Watford Petty Sessions, last Tuesday, Mr. Henry Hill, late Manager of the Rickmansworth Gas-Works, was charged with embezzling 10s. on Oct. 8, 1906, 10s. on Oct. 24, and £2 15s. on or about Sept. 29—these being sums received by him on account of the Urban District Council.

Mr. J. H. Murphy, who prosecuted, stated that the case was one of some gravity; and it was alleged against defendant that he had been guilty of systematic fraud. The charges were of embezzlement, falsification of accounts, and larceny under the Larceny Act of 1901. Defendant became a servant of the Council on the transfer of the gas-works from the Company to the Council, at a salary of £3 10s. a week. The Council gave directions as to how he should collect the money from the slot-meters, and insisted that he should bank the takings on the morning of the day following. The Council were not satisfied with the defendant's conduct; and on Dec. 7 they dismissed him, on the ground of misconduct and incompetence. Defendant was pressed to hand over his books and papers, but without effect. On Dec. 14, defendant—as an act of amazing impudence—instructed a firm of solicitors to apply for £2000 damages for wrongful dismissal. The next step was that a London firm of solicitors said they had received instructions to serve a writ for the £2000. The matter came before the Council; and they directed the Clerk to accept service of the writ. This had been done; and there the matter stood. Investigations were then made of the accounts, and it was found that in numbers of cases defendant had been to customers and abstracted cash from the meters, stating that he was in urgent need of money to pay the workmen. This was an absolute fabrication, as the men were paid every Friday. That was one class of offence. In another instance, defendant gave to a man named Wright a receipt for £2 2s.; but the counterfoil, which was in defendant's own handwriting, only showed £1 12s. The entry in the cash-book by defendant only showed a payment of £1 12s. by Wright. The index-book, showing the amount of gas consumed by Wright, gave evidence of manipulation. It was altered to agree with the amount paid in by defendant. Then there was the case of a Mrs. Webb, at Croxley Green. A man named Welch collected money from her slot-meter, and gave a receipt for £1 3s. There was no counterfoil for this amount. The entry in the index-book was no consumption of gas by Mrs. Webb; and therefore there was no payment. In October, defendant himself collected the slot money, and gave Mrs. Webb a receipt for £1 17s. The counterfoil, which should be a facsimile of the receipt, showed only £1 7s.; having on the face of it obvious evidence of having been tampered with. Defendant's entry in the cash-book, too, was only £1 7s. The index-book showed evidence of having been altered. Another case was that of a Miss Willis. On the Saturday after the Michaelmas quarter, defendant called on Miss Willis, opened the meter, and took out what money there was in it, gave no receipt, and walked off. When the meter was examined in January, it was 9s. short; but there was no evidence in the cash-book by defendant that he had received this 9s. In the case of a man named Copping, Welch collected the money and gave a receipt for £1 17s.; and the counterfoil showed only 17s. The counterfoil originally showed £1 17s.; but he suggested that the £1 had been erased, leaving only the entry of 17s. On another occasion £2 15s. was collected from Mr. Copping. A receipt was promised, but was never sent. Defendant entered in his books the receipt of £1 11s. from Mr. Copping. In the case of a man named Hounsfield, Welch collected the money for the June quarter, and gave a receipt for £1 5s. There was no counterfoil in respect of this amount; but in the place in the book where the counterfoil should be, there appeared another name in defendant's handwriting. Looking at it, one could see that the name of Hounsfield had been scratched out and another name written over it. These were specimens of the various classes of cases on which he should ask the Bench to commit defendant for trial.

A large amount of evidence was then called to bear out the opening statement of Counsel; and at its conclusion, the further hearing of the case was adjourned until yesterday (Monday), when defendant pleaded "Guilty," and was sentenced to six months imprisonment in the second division.

Dispute Over a Gas-Meter.

In the Oldham County Court a few days ago, the Corporation Gas Department sued Harry Rodgers for £2 0s. 6d. on account of the exchange of a gas-meter. It was stated by the Deputy Town Clerk (Mr. Garside) that on June 6 defendant telephoned to the Gas Department, and speaking to Mr. Massey, the Assistant-Manager, ordered his meter to be repaired, or, if necessary, exchanged. It was usual in these cases to confirm telephone orders by letter; but owing to Mr. Massey and the defendant being acquainted, the practice was not carried out in this instance. The meter was taken out in the ordinary course and despatched to a firm who repaired meters for the Corporation. This firm decided that the meter was not worth repairing, so the Corporation fixed a new one. For the defence, Mr. Marland called Mr. Rodgers, who contended that he only gave an order for the repair of the meter and not for its exchange. If the meter was found to be unfit, he should have been acquainted to this effect, and he would have got a second-hand one for a guinea. Mr. Marland also alluded to the fact that on June 12 last year, the Corporation Gas Committee passed a resolution, which was confirmed by the Council in July, that "the Corporation should take over and maintain in working order, at their own cost, all meters that had been in use for a period of not less than five years." Mr. Garside said this was passed subsequent to the order being given; but Mr. Marland replied that the meter was not fixed until July. His Honour Judge Bradbury said there was an unfortunate conflict of evidence. There was no confirmation of the order by letter; but a memorandum made at the time by Mr. Massey, which had been handed in, showed that the order was for repair, or, if necessary, an exchange of the meter. The defendant trusted to his memory, and stated that he did not remember asking for the exchange of the meter. He (the Judge), however, came to the conclusion that the order was given as stated by the Corporation; and if this was so, they were entitled to take the usual steps. A corporation were not expected to get second-hand meters. He accordingly gave judgment for the Corporation for £2 0s. 6d., and costs; at the same time remarking that it was unfortunate the case should have been disputed.

Power-Gas Corporation.

In their report for the twelve months to September last, the Directors of the Power-Gas Corporation state that the year's trading of Messrs. Ashmore, Benson, Pease, and Co., shows a profit of £1581, as compared with a loss of £1483. This result would have been considerably improved if the works could have been kept as busy during the whole of the financial year as they were during the first part of it. They are, however, at the present time well employed; and there appears to be a prospect of continued activity in the engineering trade. Messrs. Ashmore, Benson, Pease, and Co. are the only debenture holders and the principal shareholders in the "A.B.P." Accumulator Company, whose business formed a department of the Stockton works when they were originally taken over by the Corporation. It having been found impossible, in spite of prolonged efforts, to make this business a profitable one, it has now been decided to liquidate the concern voluntarily, so as to avoid further losses. The Corporation have not received the benefit of any income, either from their advance to, or shareholding in, Messrs. Ashmore, Benson, Pease, and Co. The Directors have to report that several important producer-gas installations have been satisfactorily completed and started work during the year. A number of such installations are in course of construction and erection; and negotiations are pending for further business, some of which it is hoped will soon be concluded. The balance-sheet shows a balance to the credit of profit and loss account of £5482, which the Directors propose to apply as follows: To be written off preliminary expenses account £2300, and to be carried forward, £3182. The Auditors' report states that, "the property account of the Company appears in the balance-sheet at cost without depreciation. The investment in, and advances to, Messrs. Ashmore, Benson, Pease, and Co. are taken at cost without depreciation. That Company anticipate a loss, which is not provided for, on their investment in, and current account with, the 'A.B.P.' Accumulator Company, which is in liquidation. The investments in other Companies are taken at face-value; but for these the market price, where available, is considerably less than face-value. The estimate of profits on contracts partly executed, as in former years, has been made by officials of the Company."

Colne Water Supply.—At the meeting of the Colne Town Council last Wednesday, they decided to apply to the Local Government Board for sanction to borrow £2500 for the erection of filters, a meter, and the necessary building at the Laneshaw reservoir; also a further sum to cover the cost of laying additional and enlarged water-mains in various parts of the borough.

Market Deeping Water Supply.—At a meeting of the Market Deeping Parish Council last Thursday, a letter was read from the Bourne Rural District Council respecting the South Lincolnshire Water Bill; and it was resolved that, as the parish had an ample supply of water, the Council were of opinion that there was no necessity for the extension of the Water Company's undertaking so as to include it. The Council further considered that the Rural District Council would be the best authority for supplying water within the parish; and the Parish Council would support in every way in their power any action the Rural Council might take in opposing the Bill.

REGISTER OF PATENTS.

Treating Coal Gas to Extract Tar and Ammonia.

FELD, W., of Hönningen-on-Rhine, Germany.

No. 26,262; Dec. 16, 1905.

The patentee points out that, in general practice, tar has been separated from gases (illuminating gases, and gases from coke-ovens, producers, lignite coal stills, and analogous gases containing tar, water, and ammonia) by cooling the gases at a low temperature, so that the water in them is condensed at the same time as the tar; the cooling generally being carried on until the gases leave the coolers at about the temperature of the air—say, from 20° to 25° C.

It has been proposed to first separate the tar by cooling the gases down to a temperature of from 65° to 70° C. (so that less illuminants are absorbed by the tar), and then to condense the water, together with part of the ammonia of the gas, by further cooling. But this does not have the desired effect, as by cooling alone the tar, being suspended in the form of very fine liquid particles, cannot be completely separated from the gases. On the one hand, the tar separated is mixed with water and ammonia; and, on the other hand, the condensed water is mixed with the part of the tar left in the gases and absorbs a considerable portion of the volatile compounds of ammonia with carbonic acid, hydrocyanic acid, and sulphuretted hydrogen. From about one-half to two-thirds of the ammonia is thus absorbed from the gases by the condensed water; and this constitutes "virgin liquor," which is mixed with tarry matters, and is a very weak and impure ammonia liquor.

In order to obtain the remaining one-third or one-half of the ammonia from the gases, according to one method they have been first treated with virgin liquor and then with fresh water. The liquors were mixed with tarry matters and very impure, and gave weak ammonia liquors—these liquors, being weaker in proportion to the amount of fresh water, used to absorb the ammonia from the gases.

Thus in these old processes the ammonia is recovered in two different forms—both being impure and weak liquors, containing tarry matters, and the tar containing ammonia. The treatment of the impure and weak liquors necessitates dealing with large volumes (quite out of proportion to the value of the ammonia recovered); and this requires large distilling plant, "which, however, can only produce impure ammonia compounds containing tarry matters and other impurities, and giving objectionable waste gases and liquors." For this reason the recovery of ammonia from such gases is, in many cases, impracticable, especially if much water be contained in the coal distilled—as is the case, for instance, with the gases from lignite coal stills, such gases frequently containing as much as 50 per cent. of water. For the same reason the extraction of ammonia from coal gases containing ammonia and carbonic acid, by treating the gases with salt solutions, could not be effected; the salt solutions being too much diluted by the water condensed from the gases.

It has also been proposed to treat the gases in a centrifugal apparatus above 100° C., and then to absorb the ammonia from the hot gas by acids. But complete separation of the tar is not possible by this means; and part of it is condensed in the acid bath.

According to the present invention, the patentee proposes to first completely separate the tar from the gases at such a temperature that no ammonia is absorbed by the tar, and then to separate the water from the gases, without carrying away ammonia with this water.

This separation of tar and water is effected by special treatment of the gases, first with tar, already separated from the gases and before it leaves the washer, and then with water separated from the gases—the treatment being performed at a temperature above 40° C., as hereafter explained, and by passing the gases first through a spray of the tar and afterwards through a spray of the water. Having thus separated the tar and water from the gases, the gases still contain their original amount of ammonia; and this ammonia is then extracted from the gases by means of acids, or salt solutions, and the ammoniacal solutions are obtained undiluted by the water of the gases, and not mixed with tarry matters and other impurities. At a temperature above 40° C., most of the ammonia compounds present in the gases—such as the carbonate, cyanide, and sulphide—are volatile or decomposed, and only a small part of them can be formed and dissolved in the tar and in the water separated. The higher therefore above 40° C. the temperature of the gases is kept in separating the tar and water, the less will be the amount of ammonia absorbed by the tar and condensed water; and in the process according to this invention, it is possible, by the special treatment, to separate the tar at a temperature even as high as 500° C.

The invention—the specification of which is not illustrated—is carried out as follows: The gases first have the tar separated from them while they are at a temperature under 500° C.—say, between 100° and 200° C.—the tar at such temperature being separated from the gases in the form of drops, by being caused to pass through hot tar already separated and before it leaves the separator, and therefore before being cooled; the tar being dispersed in the form of fine spray across the space through which the gases under treatment pass, so as to cause the tar, suspended in the gases in the form of a mixture of soot and liquid tar-oils, to be formed into drops, in order that the whole, or practically the whole, of the tar is separated from the gases without water being condensed. To remove the last traces of tarry matters from the gases, they may be treated in a second apparatus at or about the same temperature as before (under 500° and preferably between 100° and 200° C.) with tar-oil or thin tar already separated from the gases employed as a spray through which the gases pass, as described with regard to the first separation of tar. If the temperature of the gases passing the tar-washer be lower than 100° C., some water will be condensed; but this will not absorb much ammonia, provided that the temperature be kept above 40° C.; and such water separated from the tar can be used in the next apparatus to separate the rest of the water of distillation as hereafter described with regard to the water condensed in the cooling apparatus.

The gases thus freed from tar, and being in a warm and moist condition, enter the water-separator; and the separation of water is effected by passing the gases through the sprayed water (using for this purpose water already separated from the gases) in a way similar to that in which the separation of tar was effected, as already described. This causes the water contained in the gases in the form of vapours or finely suspended liquid to combine to form drops and to separate from the gases. The water from the cooler hereafter referred to may be used; and this water may be warm, or even hot. Both the tar-separator and the water-separator, in which the liquids are spread in the form of fine spray across the space through which the gases pass, may be constructed as described in patent No. 11,206 of 1905. If fixed ammonia compounds be present, some milk of lime is run into the water-separator, together with the water, to prevent ammonia from being absorbed by the water run into the separator. If the temperature of the water leaving the separator be not high enough to decompose the fixed ammonia compounds, steam can be blown into the water before it leaves the separator, or the water may be heated some other way. The main part of the water is separated from the gases without carrying away ammonia. It is most advantageous, the patentee remarks, to conduct the process in such a way that the gases entering the separator have a temperature of from 90° to above 100° C., in which case the separated water leaves the separator so hot that no steam is necessary to decompose the ammonia compounds in the water.

The following is an example of how the separation of water is effected after the separation of tar has been effected as described: If coke-works coal, containing 12 per cent. of water, be distilled, and if, from this coal, 300 cubic metres of gases be produced per ton of coal, the gases contain 120 kilogrammes of water per 300 cubic metres of gases, or 400 grammes of water per cubic metre of the gases. If the gases enter the water-separator at 120° C. and leave it at 65° C., the gases, according to their capacity of saturation with water vapours at 65° C., leave the separator still containing 160 grammes of water per cubic metre; 240 grammes of water being separated in the water-separator. The gases coming from this separator are cooled (in a cooling apparatus arranged behind the water-separator) from 65° to 40° C., and leave the cooler, according to their capacity of saturation, at 40° C., with 50 grammes of water per cubic metre—110 grammes of water being condensed in the cooler. This water, condensed in the cooler at 40° C., contains some ammonia, and is run into the water-separator and spread therein in the form of fine spray in order to give off to the gases the ammonia absorbed in the cooler, and, by passing through the hot gases in the separator, the water is heated from 40° up to between 90° and 100° C., and gives off its ammonia to the gases—the water leaving the separator free from ammonia.

The gases, on their way through the separator, giving off their heat to the water run in and being cooled from 120° to 65° C., take up the ammonia from the water run into the separator; while the water separated in the separator cannot, at its temperature of separation, absorb ammonia from the gases. The gases coming from the cooler at 40° C. are treated with an acid, such as sulphuric, sulphurous, hydrochloric acid, or the like, or with a solution of a salt of an alkali, an earth alkali, magnesia, or the like, giving off ammonia and carbonic acid to the solutions in forming corresponding ammonia salts. Chloride or sulphate of lime, or of magnesia, in solution, or suspended in solutions, or water, may be used. For example, in washing with chloride of magnesia, the following reaction occurs:—

$$MgCl_2 + 2NH_3 + CO_2 + H_2O = MgCO_3 + 2NH_4Cl_2.$$

By the simultaneous action of the ammonia and carbonic acid of the gases upon the salt solution, in the case of the salts mentioned, corresponding ammonia salts and insoluble carbonates are formed.

If the salt solution be run into the ammonia washer at 40° C.—that is to say, at the temperature of the gases to be washed—no moisture from the gas will be condensed in the salt solution, and this will not be diluted, nor, by reason of the separation of the tar as described, will its purity be affected by tarry matter or other impurities.

In working as described, the separation of tar will be complete, and the tar, separated from the gases at a temperature above 100° C., being free from water and ammonia, will be more valuable than hitherto, and also the recovery of ammonia will be complete—the ammonia being extracted uniformly and in the form of a liquor "which is more concentrated and purer and more valuable than hitherto."

Coin-Freed Mechanism.

TOURTEL, J. M., of Queen Victoria Street, E.C.

No. 1751; Jan. 23, 1906.

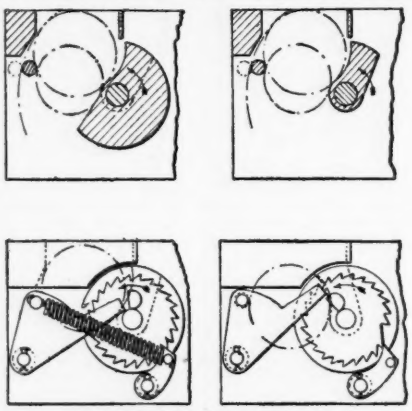
This invention, connected with coin-freed mechanism and coin-traps, relates to the kind of mechanism in which a spindle carries a ratchet wheel and a disc or stop; the wheel engaging with a lever which is disengaged by the coin when pressed forward by the stop. With such mechanism, it has hitherto been usual to provide a coin-receiver having a transverse or a longitudinal slot for the reception of the coin; but the present patentee, instead of using such a receiver, employs a coin-trap of the type in which a sliding plate is moved in one direction by hand—the return movement being effected by a spring; and the trap is provided with a finger or stop, which prevents the return movement unless the coin is discharged from it.

The mechanism and coin-trap are made as shown (p. 354). There is an operating spindle supported in a frame and bearing a disc finger or equivalent placed in proximity to one of the faces of the frame. Upon the spindle, or in operative connection therewith, is a non-return ratchet wheel engaging with a pawl fixed to the frame. Pivoted to the frame is a locking lever provided with means for engaging with a stop placed upon, or in connection with, the operating spindle. The lever is also provided with a pin or projection, called the "lift pin." Means are furnished for guiding a coin into the required position in which it will rest directly or indirectly upon the operating spindle, and against the lift pin. Upon the operating spindle being turned through the distance of the free-play, the finger will be brought against the coin and force it against the lift pin, removing the locking lever out of the path of the stop. The operating spindle may now be turned through a

complete revolution (during which the coin is ejected), when it will be again locked.

If a smaller coin be introduced into the mechanism, it will pass freely between the operating spindle and the lift pin, and drop into the till below.

The coin-trap is a cylindrical case placed axially at right angles to the coin-guide. Within the case is a plunger, preferably formed of two discs supported at a sufficient distance apart to allow a coin to pass between them. The cylindrical case is sufficiently open at one end to operate it, but preferably closed at the other. It is provided with two transverse slots (inlet and outlet) of sufficient size to allow a coin to pass; the inlet slot being at the top of the case and preferably near the open end, while the other slot is at the bottom and nearer the closed end of the case. Within the case is a spring, which presses the plunger forward against a stop, in which position it is ready to receive a coin. If a coin be introduced and the plunger be pressed back, the coin will drop through the bottom slot of the coin-trap case, and will pass into the coin-guide and rest upon the operating spindle and the lift pin.



Tourtel's Coin-Freed Mechanism.

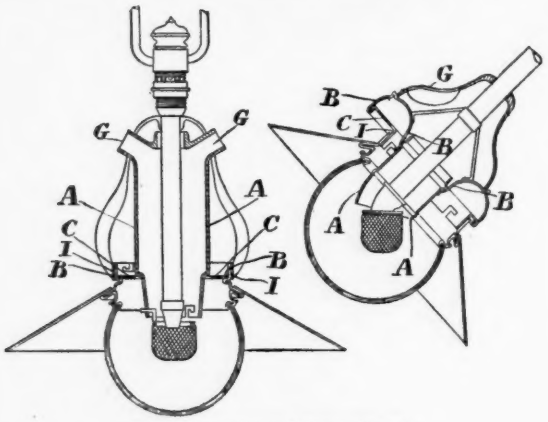
The first two illustrations show part of the frame of the device and the relative positions of the disc or finger and the pin or projection on the locking lever—the coins being shown in broken line. The other two show the ratchet wheel, the pawl engaging it, and the locking lever—a coil spring being used to hold the lever and pawl to their work. The fourth figure shows the mechanism released.

Incandescent Gas Burners and Fittings.

HELPS, GEORGE, of Nuneaton.

No. 947; Jan. 13, 1906.

This invention refers to fittings used for inverted or partially inverted burners, and consists in a special form of draught inducer or chimney. The portion below the supporting shoulder may be straight or of such shape that the mantle is held vertically while the globe and shade are at any angle; the deviation in the burner-nozzle inserted in the mantle being obtained by one or more bends—thus allowing the mantle to be placed practically central in the globe. The portion of the burner-tube below the holder (for carrying the globe, and nearest the mantle) may, however, be bent to keep the mantle in a vertical position.



Helps's Incandescent Burner Fitting.

In the first arrangement shown, the draught inducer or chimney A is supported by a ring B, having holes C for the ingress of air; the chimney having a shoulder rest upon the ring, which is attached to, or supported by, the globe-carrying ring. The chimney supports the mantle, and the waste-gas outlets are shown at G. The ring I is attached to the outer arms, and the carrier B is secured to the ring which carries the globe and shade. The mantle is secured to the chimney A; so that the chimney, mantle, globe, and shade are all carried by the arms.

In the second form of the invention, in addition to the draught inducer A, an upper portion is also provided. C are air inlets; the shoulders at D keeping the draught inducer in position and allowing (there being more than one shoulder) it to slide up the burner-tube. The arms are here attached to the ring B, which, in this case, is carried by the arms. The burner-nozzle is bent so that the mantle is vertical, although the globe and holder are at an angle to the vertical.

Producing Ferrocyanides from Cyanogen Contained in Gases.

JOHNSON, J. Y.; a communication from W. FELD, of Hönningen-on-the-Rhine, Germany.

No. 5775; March 9, 1906.

In order to obtain ferrocyanides from the cyanogen in coal gas and the like, such gas has been treated with a suspension, or solution of an iron compound (such as ferrous-carbonate, hydroxide, sulphide, sulphate, chloride, or mixtures thereof) together with a basic substance such as alkali, earth-alkali, magnesia, or ammonia. In some cases the ammonia present in the gas has been used as the basic substance, with or without the addition of a salt solution to the iron compound. The gases, as a rule, contain sulphuretted hydrogen, by the action of which upon the iron compound in the presence of basic substances, all the iron is converted into sulphide of iron. If "sulphide mud" (a mixture of ferrous sulphide and ferrous carbonate) be used, the ferrous carbonate in the mud is also converted into sulphide. The absorption of hydrocyanic acid by sulphide of iron in the presence of a basic substance is slow and incomplete, as such absorption is a secondary reaction, as shown in the following equations:—

(1) $FeSO_4 + 2NH_3 + H_2S = FeS + (NH_4)_2SO_4$.
(2) $FeS + 2NH_3 + 2HCN = Fe(CN)_2 + (NH_4)_2S$.
(3) $Fe(CN)_2 + 4NH_3 + 4HCN = (NH_4)_4Fe(CN)_6$.

The patentee has now found that the conversion into sulphide of iron is avoided if an iron compound be employed which, by treatment with a ferrocyanide of an alkali, an earth-alkali, magnesia, or ammonia, before the iron compound comes into contact with the gas to be treated, is converted into ferrous cyanide—

(4) $2FeSO_4 + Ca_2Fe(CN)_6 = 3Fe(CN)_2 + 2CaSO_4$.

To explain the process, the compound precipitated from ferrocyanide solutions by ferrous salts is referred to as ferrous cyanide, $Fe(CN)_2$, although this precipitate is supposed to be ferrous ferrocyanide, $Fe_2Fe(CN)_6$, or a compound of similar constitution, which frequently contains an admixture of alkali, earth alkali, and ammonia ferrocyanide in small proportion. It is essential for the process that this compound shall contain iron and cyanogen in the molecular proportion of one or two respectively, as indicated by the formula $Fe(CN)_2$.

In using ferrous sulphate as the iron compound and ferrocyanide of calcium for its precipitation, gypsum and ferrous cyanide are formed. If the gas be treated with this ferrous cyanide, the absorption of hydrocyanic acid becomes a primary one, as shown in Equation 5. The ferrocyanide used for the formation of ferrous cyanide can be soluble, or insoluble—for example, calcium-potassium ferrocyanide, $CaK_2Fe(CN)_6$, and the like may be employed.

The following example is given by the patentee to show how the invention may be performed, in which ferrous chloride ($FeCl_2$) is the iron compound employed and calcium ferrocyanide is used to precipitate the ferrous cyanide, while lime is the basic substance employed. The ferrous chloride is dissolved in water, and to this solution is added sufficient calcium ferrocyanide to precipitate all the ferrous chloride from the solution. To two molecules of ferrous chloride, nearly one molecular proportion of calcium ferrocyanide is used; but an excess of calcium ferrocyanide does not interfere with the process. Insoluble ferrous cyanide and soluble calcium chloride are formed. The calcium ferrocyanide solution may be added to the ferrous chloride, or the ferrous chloride may be added to the calcium ferrocyanide solution. The liquor thus prepared is mixed with at least two molecules of lime for each molecular proportion of ferrous chloride. The basic substance may be added to both the solutions either before or after the precipitation of ferrous cyanide. In treating the gas with this liquor, hydrocyanic acid is absorbed according to the following equation:—

(5) $3Fe(CN)_2 + 6Ca(OH)_2 + 12HCN = 3Ca_2Fe(CN)_6 + 12H_2O$.

The absorption is quicker and more complete than it would be if sulphide of iron were formed before the formation of cyanide, or if a mixture of sulphide and carbonate of iron (sulphide mud) were used. The process can be carried out with either hot or cold gas, and with either hot or cold liquor, and it is immaterial whether or not the gas contains ammonia. If there be ammonia in the gas, some insoluble ammonium-calcium-ferrocyanide is formed; but this formation is less in proportion as the heat under which the reaction is carried on is greater.

Instead of using a ferrocyanide salt to precipitate ferrous cyanide, the sludge which has already been used for treating gas, and which contains ferrocyanide in the required form, can be employed for precipitation. In any case, so much of the sludge must be added to the ferrous chloride solution that nearly one molecular proportion of calcium ferrocyanide is present to each two molecules of ferrous chloride. If after precipitation the liquor containing the ferrous cyanide should be too dilute, the precipitate may be separated from ferrous cyanide by filtration, and the ferrous cyanide be mixed with water or milk of lime in the required proportion before using it to treat the gas.

Automatic Gas Cut-Off.

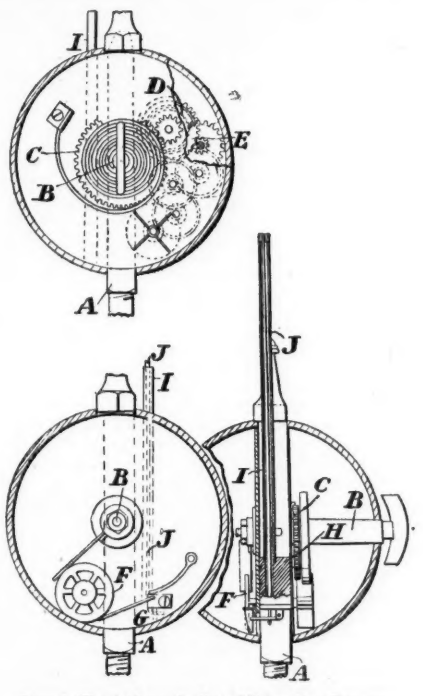
CAMPBELL, V. E., of Portland, Oregon, U.S.A.

No. 15,919; July 13, 1906.

This cut-off attachment for gas-burners used for heating, cooking, and illuminating purposes, has a valve normally held closed by a spring, but which is adapted to be locked, when opened, by a thermostatically operated brake, provided the gas is ignited. The invention consists of the spring-controlled valve employed, which, when opened, tensions the spring. The valve is geared to a train of wheels, one of which constitutes a brake wheel adapted to be contacted by a brake-strip operatively connected to a thermostat of peculiar construction, which, when heated by the ignited gas, causes the strip to be applied to the brake wheel and hold the valve open and its spring under tension.

The illustration (p. 355) shows a section through the casing, with one of the face plates and the mechanism in elevation; a similar view showing the opposite face plate and the parts on it; and a cross section of the apparatus.

Between the side plates is interposed a tube A, to be connected top and bottom with the burner and the gas supply pipe. A valve B (of the usual form) extends through the tube and the centres of the side plates, and a spring is coiled round it and fastened at one end to the valve and at the other end to a bracket extending from one of the side plates. A toothed sector C is secured to, and rotates with, the valve B, and meshes with a small gear secured to a shaft extending through the side plates. This shaft has a ratchet wheel D thereon, adapted to be engaged by a spring-pressed pawl mounted on a toothed wheel E loosely disposed on the shaft. A train of gears, located between the plates, serve to transmit motion from the wheel E to a shaft, on which is secured a brake wheel F. This brake wheel is normally contacted at its periphery by a spring check strip secured to, and movable with, the valve B. A brake lever G, pivoted on one of the plates, consists of a pivotally mounted non-resilient body and a resilient strip extending from it, and normally resting close to, but out of contact with, the periphery of the brake wheel.



Campbell's Automatic Cut-Off for Gas-Burners.

A block, secured between the plates, has an opening through it, from which extends a tube I of metal, which will readily expand when heated. The tube projects parallel with the tube A, and beyond it, so as to be heated by the gas-burner. The free end of the tube is closed, and has a rod J extending longitudinally through the tube and opening. This rod is of material which will not readily expand when heated; and its lower end extends beyond the block H, and has a laterally projecting finger, which is disposed under, and supports, an actuating lever pivoted at one end upon the lower portion of the block. This lever projects through a slot in one of the side plates and under the body of the lever G.

In using the device, the gas is turned on by the valve B. This will tension the spring and cause the sector C to rotate the gear and the shaft; while the ratchet wheel D will slip under the pawl. If the gas is not ignited, the spring will return the valve to its original position as soon as released, and also cause the rotation of the train of gears and the brake wheel F. If, however, the gas is ignited, the tube I will expand upward and carry the rod J with it, causing its finger to press against the actuating lever and swing it, and the body of the lever G, upward. The strip will therefore be pressed and held against the brake wheel F, and the gearing and valve will be prevented from rotating.

APPLICATIONS FOR LETTERS PATENT.

1524.—Griffin, C., "Gas-engines." Jan. 21.
1577.—Kratky, F., "Incandescent burner." Jan. 21.
1619.—Bray, J. W., "Incandescent burners." Jan. 22.
1640.—Campbell, H., and Craig, A., "Gas-producers." Jan. 22.
1703-4.—Blanchard, V. W., "Gas heater and cooker." Jan. 22.
1705.—Blanchard, V. W., "Gas air-heater." Jan. 22.
1706.—Blanchard, V. W., "Gas-furnace." Jan. 22.
1724.—Holland, L. C., "Gas-producers." Jan. 23.
1750.—Bushell, W. H., and Tomalin, L. R. S., "Vertical gas-range." Jan. 23.
1827.—Power, E., "Burners and mantle supports." Jan. 24.
1852-3.—Howarth, F. W., "Lighting apparatus for gas-lamps having two or more burners." A communication from Deutsche Gasglühlicht Akt.-Ges. (Auerges). Jan. 24.
1884.—Potter, W. G., "Mantles." Jan. 25.
1893.—Wigley, P., Arculus, G. N. & E. A., and Warry, J., "Inverted burners." Jan. 25.
1971-2.—Parker, T., "Distillation of coal and other carbonaceous substances." Jan. 25.
1990.—Parkinson and W. & B. Cowan, Ltd., and Cheshire, W., Regulating the supply of gas and air to atmospheric burners." Jan. 26.
2025.—Weil, R., "Incandescent burners." Jan. 26.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held on Friday, at the Chief Offices, Horseferry Road, Westminster—Mr. Corbet Woodall, M.Inst.C.E., the Governor, in the chair.

The Secretary (Mr. H. Rayner) read the notice convening the meeting; and the seal of the Company having been affixed to the register of proprietors, the report and accounts, which were given in the "Journal" last week, were taken as read.

METERS, STOVES, AND FITTINGS.

The Governor: It is now my duty to move—"That the report and accounts be received and adopted." In doing so, I desire to call your attention to a few features of interest. The expenditure on capital account has been £69,501. With the exception of a little over £4000, this has all been spent upon meters, stoves, and distribution plant generally. You will have observed that an item which has appeared for twelve years in the balance-sheet—viz., "Automatic meter supplies (fittings account)"—has now been liquidated. It will not appear again. It was our custom to charge to this suspense account a proportion of the cost of the pipes and fittings placed in consumers' houses. The custom had the approval of the Government Auditor as a temporary measure, pending the passing of our last Act; but we were pledged to him to extinguish the obligation by the end of 1906. To do this, we have had to divert some moneys which would otherwise have gone to depreciation of meters and stoves, and apply them to these fittings. Henceforth we shall be able to give due consideration to each class of this perishable plant—writing off for depreciation as may be necessary. The sum required in the past half year for clearing off the balance of the suspense account was £15,620. To show how great is the wear and tear upon meters and stoves supplied to consumers' houses, and the consequent necessity for liberal depreciation, I may mention that in 1906 we sent out 70,000 meters and 110,000 stoves, and received back 39,000 and 53,000 respectively. Our net increase was 57,000 stoves and 31,000 meters; but to secure these we had to handle 163,000 stoves and 109,000 meters.

THE REVENUE ACCOUNT.

Turning to the revenue account, you will, I think, agree with me that the result of the half-year's trading is good. On the occasion of our last meeting, I spoke hopefully of the future; and the statement in your hands justifies the expectation then expressed. Thanks to the cold weather with which the year closed, we have sent out more gas by 1·1 per cent. than we did in the corresponding half year. This is equal to 116 million cubic feet; and it has increased our revenue by £16,700, which is reduced, however, by certain increased discounts allowed, to £8354. There is a further increase in the rental from stoves on hire of nearly £2000.

REDUCED COST OF MANUFACTURE.

Due largely to the closing of costly stations, the reconstruction of works in use, the adoption of improved plant and appliances, and careful organized attention to details of carbonization, the cost of manufacture has been largely reduced. The greater quantity of gas sold has been made from a smaller quantity of coal and oil; and there has been a net saving of nearly £40,000 in manufactory charges. Residuals show a gain of £20,000; coke having brought a price 1s. per ton higher than in the corresponding half year. It is right I should tell you that of the saving in working costs £14,000 is on account of purification, and is chiefly due to the amendment of the law as to sulphur compounds, and the consequent great reduction in the use of lime. Expenditure upon repairs and maintenance of works has been less by £2434 than in 1905. But there has been no thought of checking renewals promising economy; and the works have throughout been maintained in excellent repair. The reconstruction of a large retort-house at Nine Elms has been completed, and the house equipped with inclined retorts, which are yielding excellent results. At Beckton, No. 2 of the original retort-houses has been reconstructed, and fitted with mechanical appliances. The demolition of the bench in No. 5 house at Beckton was commenced in November, in preparation for rebuilding this year. The early commencement was made in order to provide work for men who would have otherwise been unemployed. At all the stations, considerable works simplifying the handling of materials have been completed. Arrangements have been made for discharging the whole of the coal for our up-river stations at Beckton, at a considerable saving of cost.

REDUCED RATES.

We have another and unusual item for congratulation. This is the first time for many years that we have had to record any material reduction in the charge for rates. The saving of £12,000 under this head has been due, not to any falling of the rates in the pound, but to reduction in the assessment of the Company's undertaking obtained at the last quinquennial inquiry. Our rates are still, we think, extravagantly high; and effort will be made by the Directors on every available occasion to reduce this heavy charge still further.

COST OF DISTRIBUTION.

The costs of distribution show an apparent increase of £21,482. As, however, there is included a special sum of £15,620 applied in cancelling the balance of the automatic fittings suspense account, the true increase is not more than the growth in the number of consumers necessitates.

ANNUITIES.

The item "Annuities" shows an increase of £1392. This includes the contribution to the officers' superannuation fund; but the charge for officers' superannuation will be a reducing amount in the future. The sum now paid in annuities to workmen and officers is £47,888 a year.

THE NET RESULT.

The net result for the half year is that, after providing for the fixed charges, and setting aside £2500 to the insurance fund, which it is

advisable to somewhat strengthen, there is a profit of £363,940, to which has to be added £210,481 brought forward from the previous half year; making a total of £574,421 available for distribution. After setting aside £10,000 to the redemption fund, the Directors recommend a dividend at the rate of £4 8s. per cent. per annum; leaving £229,952 to be carried forward to the credit of the current half year, which period, I am glad to be able to assure you, will yield at least equally good results.

THE COMPANY AND THE IRONMONGERS.

A new departure the Company have made during the present half year is one which I am sure will be approved by the shareholders. It has long been felt that it would be desirable for the Company and the ironmongers of London to act together in promoting the use of gas-stoves. I am glad to be able to say that we have now come to an arrangement with many of the principal firms, so that they will act as coadjutors with the Company for the sale and hire of stoves and other gas appliances. It is too early to prophesy as to the result; but it is a step in the right direction, and cannot fail to be to the mutual advantage of both parties.

INSTRUCTION FOR THE STAFF AND THE CONSUMERS.

The measures for the special technical instruction of the outdoor staff, to which I referred at the last general meeting, have been in active progress during the past six months. A suitable assembly-room has been set aside for this purpose at Mare Street, Hackney—one of the Company's largest district offices; and here monthly meetings of the heads of the Chief Inspector's Department are held, at which a Director presides. Topics arising out of the operations of the department are discussed. Four times weekly technical lectures and practical demonstrations are given on the various scientific and industrial developments and improvements brought out from time to time in gas consumers' appliances. The average weekly attendance throughout these courses is 380. Already, we believe, marked success has been achieved; the working staff acquiring an increased knowledge of the proper use and value of gas for lighting and heating. I am glad to say that the arrangement announced to the shareholders a year ago, under which the services of a lady were engaged for the purpose of instructing the public in the management of gas cooking-stoves, has proved a great success. The lady demonstrator and her assistants have made a large number of calls; and their services are constantly in request by new consumers, to explain to them how to get the best results from the stoves. The Directors are gratified that this effort of the Company has been so much appreciated, and they believe that it is leading to a considerable increase in business. It must be understood that the new business which is being gathered in in satisfactory volume by the Company must necessarily be less profitable, per head of the consumers, or per million cubic feet of gas sold, than an equal bulk of consumption under older conditions. Every improvement of burners, stoves, or gas-fires, which the Company are delighted to welcome, as it means greater satisfaction on the part of the users, reduces the average consumption per service; while the greater attention now given to every consumer (small or large) on the books, entails increased working expense. We have lost more profitable business; but the new is broader based, and therefore probably more secure.

PROSPECTS FOR THE FUTURE.

As to the future, we feel some anxiety as to what will be the cost of coal in the year 1907-8. Prices much in excess of those of last year have been asked, and in some cases given, for new contracts; and it is impossible to prophesy with any certainty what may happen. Coal-owners will no doubt get as much as they can, and maintain big prices so long as they are able. When the high cost of fuel has seriously injured manufacturing industries, the cure will come automatically and painfully. It may be permitted to me to express regret, in this connection, at the recent removal of the duty on exported coal. The large quantities sent abroad tend at the same time to dissipate our national reserve and to increase the cost to the home consumer. It is surely reasonable that the country should receive some compensation for its heavy loss. In our own case, we have already replaced coal to a certain extent by oil for the manufacture of gas; and we can carry this replacement still further, if necessary. While we dare not at present contemplate reducing the charge for gas, we are resolved that nothing short of absolute necessity will induce us to raise it.

THE CENTENARY OF GAS.

The proprietors are probably aware that this week we have reached the hundredth anniversary of the lighting of Pall Mall with gas—a demonstration which was followed shortly afterwards by the formation of the Chartered Gas Company. Our story through the century has been one of continued growth and development, though chequered in some particulars. There is encouragement, in our report of to-day, for the hope that the prosperity of the Company will continue for a very long time yet to come. I now beg to move that the meeting do agree with and confirm the report.

The DEPUTY-GOVERNOR (Mr. Howard Charles Ward): I have great pleasure in seconding the motion.

REMARKS BY SHAREHOLDERS.

Mr. A. BURRELL asked for some particulars with regard to the property to be sold.

Mr. F. W. BRUCE said he should be glad to have some information as to the item of £148,000 odd invested in securities, as he noticed that the amount carried forward came to about £60,000 more than was invested. Was the difference put into the business?

Mr. KILLINGWORTH HEDGES said, as this was the first time he had been able to attend one of the meetings since the appointment of the new Governor, he wished to congratulate the shareholders upon the excellent appointment which had been made. There was one matter upon which he might touch, though he would not have ventured to do so in bygone days; but as they now had such a distinguished Engineer at the head of affairs, he might refer to it. It was the gas unaccounted for. This was rather more than the amount used for lighting the streets of London. He knew that in all gas companies there was a large quantity of gas that was not accounted for. But in their case it had been particularly large; and he would venture to suggest that the Governor should look into the matter, and see whether the amount could not be reduced. As a gas and electrical engineer, he was inclined to think there were many ways in which their great leakage might be brought down. If an electricity supply company had the same amount of leakage, they would soon have to shut up shop, as they had no bye-products to dispose of. He did not know whether the leakage had grown since the number of motor vehicles had increased, especially those of a heavy class for drawing loads. No doubt many persons had noticed vibration in their houses since the introduction of motors; and if gas-pipes were affected in the same way, it would be a serious matter in the future, as the number of motor vehicles increased. If the Engineers of the Company had noticed anything of the kind, he hoped they would report the matter to the Home Office, as a Bill would shortly be introduced for governing mechanical traffic. He recently took part in a deputation to the Home Secretary upon the subject, when that gentleman stated that he would be pleased to consider all industries affected by motor traffic.

The GOVERNOR: With regard to the amount invested, the explanation is that the depreciation fund for works on leasehold lands is not invested, but is used by us in the business—that is to say, it is invested in the Company's business.

Mr. BRUCE: Is the reserve fund and also the insurance fund included in the £148,000?

The GOVERNOR: Yes.

Mr. BRUCE: Where is the interest derived from on the depreciation fund?

The GOVERNOR: Although the amount is not invested outside the undertaking, inasmuch as we use it instead of money we should otherwise have to raise, we charge ourselves with the interest, and bring it to the credit of the capital fund. As to the property put up for sale, it was withdrawn, as the prices offered were not such as we were advised we ought to receive. I am much obliged to Mr. Killingworth Hedges for his interesting criticism; but I think he has lost sight of the fact that there was a Royal Commission on Motor Cars last year, before which our Distributing Engineer gave evidence. We represented in the strongest possible light the injury that gas and water mains were suffering by reason of the very much increased weight of traffic carried over the streets. In my observations to the shareholders six months ago, I think I mentioned that in a particular length of road ten years previously we had had a certain number of escapes to deal with, and in the year 1905 the number had increased ten times on the same length of road and mains. The position is certainly a serious one; and it does not escape the notice of the Directors or of their officers. Because of settlements which have taken place in various parts of London—due partly to the construction of underground railways and the vibration they cause—the roadway is carried on the concrete arch with in many cases little support from the ground below it. The gas absolutely unaccounted for is not such as to cause us to blush. In the past year the quantity was 5·26 per cent. Last year it was 5·50 per cent.; and the average of the London Companies was in that year 5·16 per cent. In the case of the Suburban Companies, it was nearly 6 per cent. In Glasgow it is 8·71 per cent. We used to be proud of the small amount of our leakage, and we regret to see it increase in however small degree. I think this answers all the questions that have been addressed to me, and I will now put the resolution.

This having been done, it was carried unanimously.

THE DIVIDEND.

The GOVERNOR: I now beg to move that the following dividends be declared: On the ordinary stock, at the rate of £4 8s. per cent. per annum; on the convertible 5 per cent. stock, £5 per cent. per annum; on the 4 per cent. consolidated preference stock, £4 per cent. per annum; and on the 3½ per cent. maximum stock, £3 10s. per cent. per annum—all to be paid on the 1st of March next.

Mr. T. A. GREENE asked what was the redemption fund?

The GOVERNOR said it was a fund the Company undertook, at the suggestion of the Parliamentary Committee, to form to write off capital not represented by assets. The total amount they had undertaken to write off was £1,000,000 sterling; and they were doing it at the rate of £10,000 half yearly. They had already written off £40,000, and they had now £20,000 more to invest.

The motion was put and carried unanimously.

RE-ELECTION OF DIRECTORS AND AUDITORS.

The GOVERNOR proposed the re-election of Mr. Ulick John Burke to his place on the Board, which he had held for very many years.

Mr. KILLINGWORTH HEDGES seconded the motion, and it was carried unanimously.

The GOVERNOR next proposed that Mr. Herbert Jameson Waterlow be re-elected a Director. He explained that Mr. Waterlow came up for re-election for the first time. He was chosen to fill the last vacancy on the Board; and he (the Governor) congratulated the shareholders on the choice the Directors were able to make. Mr. Waterlow had already proved himself, with his great business knowledge and experience, a most valuable member of the Board.

Mr. C. E. JONES, in seconding the motion, said the name of Mr. Waterlow was a very honourable one; and he thought the shareholders ought to congratulate themselves upon securing his services. He (Mr. Jones) heartily approved of the introduction of new blood.

The motion was carried unanimously.

On the motion of Mr. J. REESON, seconded by Mr. G. E. P. HODGE, the retiring Auditors (Mr. J. A. Stoneham and Mr. J. J. Walker) were unanimously re-elected.

The GOVERNOR: Ladies and gentlemen, this completes the business before the meeting, with the exception that I wish to mention to you that I have received a letter from Mr. Field, our late General Manager, who is Treasurer to the Church Building Fund at Beckton. The church is built on land bought from the Company, and is used almost exclusively by workmen in their service. Mr. Field calls attention to the fact that the money necessary for the construction of the building is not yet subscribed, and when the church is opened in April, it is very

desirable that there shall not be a burden of debt on it, seeing how poor the people are who will have the work to carry on there. The Company, I am afraid, are not in a position to make a grant out of their own funds; and I can only suggest to you that there are obligations upon us, as shareholders, to the workmen who serve us, which I think many are glad to recognize. If some of you are disposed to help the building fund of the church, your contributions will be very welcome. I should not think of making this suggestion were it for one denomination alone. We have provided for the Nonconformist congregation a room which serves the purpose of a chapel; consequently, there is no preference of one denomination over another.

VOTES OF THANKS.

Mr. KILLINGWORTH HEDGES proposed a hearty vote of thanks to the Governor for the able way in which he had conducted the business of the meeting, and for so clearly answering the questions put to him.

The motion having been seconded, it was put and carried unanimously.

The GOVERNOR: Mr. Hedges, ladies, and gentlemen, on behalf of my colleagues and myself, I thank you cordially for this vote. We are exceedingly glad to be able to put before you so good a statement; and, as I have said already, we hope to repeat it in the half year that is now current. Before we separate, I should like to move—"That our best thanks be given to the officers of the Company for their excellent services during the past half year." You know there have been material changes in the staff of the Company. Our General Manager, our Chief Engineer, our Secretary, our Chief Inspector, are all young fellows full of zeal and energy, and, I am happy to say, with judgment and wisdom sufficient to guide their zeal. I cannot use words too strong to express our sense of complete satisfaction with the way in which their duties have been carried out. With regard to the Distributing Engineer (Mr. G. F. L. Foulger), he is not quite so young as he would like to be; but we see no sign of any falling off in his energy and capacity. With regard to the Engineers of the stations, I can say it is a great pleasure to walk round the stations with them, because of the heartiness with which they interest themselves in all that concerns the credit of the works and the advantage of the Company. I hear on all hands, both with regard to the works and the distributing staff, that the men are working as well and cordially as we could wish them to do. I therefore propose that the thanks of the shareholders be given to the officers and workmen for their services during the past half year.

The DEPUTY-GOVERNOR seconded the motion.

Mr. T. A. GREENE said he thought the thanks of the proprietors were particularly due to the staff for the great ability they had displayed in the Company's business. To his mind, the position of Distributing Engineer was one of great anxiety, as that gentleman might be called upon at any moment, night or day, to superintend the repair of the mains.

The motion was put and carried unanimously.

The GENERAL MANAGER (Mr. D. Milne Watson), in the name of the staff, returned thanks for the very kind resolution the shareholders had just passed. He said he could assure them that it was a great pleasure at all times to the staff to do their duty towards the shareholders, and to work in their interests.

The proceedings then terminated.

BRENTFORD GAS COMPANY.

Half-Yearly Report and Accounts.

In the report to be presented by the Directors of this Company at the half-yearly meeting on the 15th inst., they state that there is a sum of £92,555 available for distribution; and they recommend dividends, subject to income-tax, at the rates of 5, 12½, and 9½ per cent. per annum on the preference, consolidated, and new stocks respectively. After payment of these dividends, there will remain a balance of £53,305 to be carried forward. The Directors express regret that, with the exception of coke, the market for residual products still remains depressed; and this, coupled with the very considerable increase which has lately taken place in the price of coal, to some extent prejudicially affected the result of the past half-year's working.

The accounts accompanying the report show that the revenue from the sale of gas amounted to £161,181; from meter and stove rents to £17,023; from the sale of residual products to £29,273—rents and transfer fees making up a total of £207,514, compared with £200,250 in the corresponding period of 1905. On the other hand, the manufacture of gas cost £106,231; distribution, £35,855; and management, £6303—the total expenditure being £165,900, against £158,298. The balance carried to the profit and loss account is £41,614, compared with £41,952 this time last year. The working statements show that 81,367 tons of Newcastle coal and "Solar" oil equal to 35,233 tons were used in the production of 1,256,560,000 cubic feet of gas, of which 1,160,413,000 cubic feet were sold and 1,175,413,000 cubic feet accounted for. The estimated production of residuals was: Coke, 50,873 tons; breeze, 6346 tons; tar, 891,259 gallons; and ammoniacal liquor, 23,360 butts.

Fire at the Rotherhithe Gas-Works.

At about 1 o'clock last Wednesday afternoon, a fire broke out at the Rotherhithe works of the South Metropolitan Gas Company. It appears that, through some cause at present unexplained, some gas which was in process of being purified escaped from one of the boxes, and igniting set fire to the floor and roofing of a shed in which the material used for purifying is stored. A foreman was burnt about the hands and face, though, it is stated, not seriously. The fire was extinguished by the joint efforts of the Company's officials and the Metropolitan Fire Brigade; valuable assistance being afforded by the floating fire-engine of the Surrey Commercial Docks Company. The damage done does not amount to more than £500 or £600.

SOUTH METROPOLITAN GAS COMPANY'S ACCOUNTS.

[For the Half-Yearly Report, see p. 335.]

The following are the principal portions of the accounts of the Company for the six months ending Dec. 31.

The first two statements relate, as usual, to the stock and loan capital. The former sets forth that the standard rate of 4 per cent. is payable on £6,011,224 and £338,776 (Act of 1901) of stock; while the latter shows that the loan capital, the rate of interest on which is 3 per cent., amounts to £1,798,994 and £96,451 (Act of 1901). The third statement is the capital account. It stands as follows: Amount received, £5,226,554; nominal amount added by conversion (less premium), £3,018,891—total, £8,245,445. The items of expenditure are as follows:—

Capital account to June 30, 1906		£4,909,481 15 3
Expenditure during half year to Dec. 31, 1906, viz.—		
New buildings and machinery in extension of works	£19,221 14 9	
Purchase of Land	15,826 15 7	
New and additional mains and services	24,928 10 0	
New and additional meters	13,203 4 4	
New and additional stoves	7,140 10 6	
		80,320 15 2
Total expenditure		£4,989,802 10 5
Balance		236,751 9 7
		£5,226,554 0 0
Nominal amount added by conversion, less premium		3,018,891 0 0
Total		£8,245,445 0 0

The following is the revenue account:—

Expenditure.

Manufacture of gas—		
Coal into store, including £24,451 15s. 4d. for labour	£331,120 3 2	
Purification, including £9516 3s. 9d. for labour	11,707 4 7	
Salaries of Engineer and Officers at works	13,833 5 10	
Wages (carbonizing)	57,984 4 0	
Repairs and maintenance of works and plant, including £51,342 16s. 10d. for labour, less £4940 13s. 3d. received for old materials	83,406 6 0	
		£518,111 3 7
Co-partnership		18,000 0 0
Distribution of gas—		
Repair, maintenance, and renewal of mains and service-pipes, including £19,074 8s. 3d. for labour	£23,661 13 8	
Salaries and wages of officers, including rental clerks	17,180 12 5	
Repairing and renewals of meters, including £5635 6s. 7d. for labour	23,808 13 5	
Repairing and renewals of stoves, including £11,079 0s. 3d. for labour	22,761 3 11	
		87,412 3 5
Public lamps, including £10,938 9s. 2d. for labour, and £6516 1s. 4d. for materials, less £16,571 7s. 3d. received for the same		523 3 3
Rents, rates, and taxes—		
Rents payable	£1,031 9 10	
Rates and taxes	44,109 8 2	
		45,140 18 0
Management—		
Directors' allowance	£2,502 6 0	
Salaries of Secretary, Accountant, and clerks	3,159 7 6	
Collectors { Ordinary	6,149 12 2	
Collectors { Slot meter	7,868 1 7	
Stationery and printing	2,591 13 7	
General charges	8,691 5 6	
Company's Auditors	112 10 0	
		31,074 16 4
Law charges	£1,536 15 0	
Parliamentary charges	4 5 3 4	
		1,951 18 4
Bad debts		1,633 15 7
Pensions and officers and workmen's superannuation, sick, and accident funds		7,137 7 11
Gas Referees and Official Auditor		124 10 9
Total expenditure		£711,109 17 2
Balance carried to net revenue account		191,226 16 11
		£902,336 14 1

Receipts.

Sale of gas—		
Michaelmas, at 2s. per 1000 feet	£229,204 17 10	
Christmas, at 2s. per 1000 feet	346,735 0 8	
	£575,939 18 6	
Public lighting	14,737 15 0	
		£590,677 13 6
Meters in use (316,862)—		
Company's meters at rent: Ordinary, 102,0,2; slot, 206,090	£34,495 8 11	
Company's stoves at rent: Ordinary, 72,681; slot, 172,484; fires, 21,707	27,717 9 7	
		62,212 18 6
Residual products—		
Coke, less £2912 5s. 9d. for cartage; £10,358 12s. 9d. for labour, &c.	£154,593 14 4	
Breeze, less £183 0s. 1d. for cartage; £2753 18s. 4d. for labour, &c.	6,466 1 2	
Tar and tar products, less £4210 6s. 0d. for labour	32,282 17 4	
Sulphate of ammonia, less £4694 7s. 2d. for labour	51,678 9 2	
		245,027 2 0
Rents receivable		1,731 14 1
Transfer fees		87 15 0
Sundries		2,599 11 0
Total receipts		£902,336 14 1

The net revenue account shows a sum of £165,261 7s. 2d. applicable to dividend on the ordinary stock. Following this are the statements relating to the reserve, renewal, and insurance funds. They show that the balances on Dec. 31 were as follows: Reserve fund, £178,396; renewal fund, £25,333; insurance fund, £106,737. In the last-named account, a sum of £1500 is charged for "loss on coal by heating."

The statements furnishing manufacturing details are as follows:—

Statement of Coal.

In Store June 30, 1906.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store December 31, 1906.
Tons. 68,459	Tons. 631,001	Tons. 594,289	Tons. 878	Tons. 104,293

Statement of Residual Products.

Description.	In Store June 30, 1906.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store Dec. 31, 1906.
Coke—cwts.	160,664	7,368,275	1,923,800	5,338,983	266,156
Breeze—yards	14,903	126,787	46,250	73,278	22,162
Tar—gallons.	731,247	5,757,669	5,408,929	67,245	1,012,742
Ammoniacal liquor—butts	8,881	186,831	183,948	..	11,764

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights (estimated).	Private Lights (per Meter).		
Thousands. 6,517,123	Thousands. 172,872	Thousands. 5 858,520	Thousands. 6,112,125	22,362 incandes't 766 flat flame

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, £61,527; coke and breeze, £10,611; tar, sulphate, and ammoniacal liquor, £55,259; and sundries, £275,126. The figures this time last year were: Coal, £60,175; coke and breeze, £4665; tar, sulphate, and ammoniacal liquor, £55,754; and sundries, £262,712. A sum of £57,800, workmen's bonuses and savings, has been deposited with the Company; and the total of the officers' superannuation and guarantee funds is £37,089. The figures last year were £65,596 and £30,942. The item, "Monazite sand suspense account," now stands at £19,420, compared with £24,139 at the end of December, 1905.

CENTENARY OF GAS LIGHTING IN PALL MALL.

[From the "Daily Telegraph," Jan. 29.]

If Londoners had been given to the celebration of centenaries, they would have illuminated the town from end to end last night. Or, at least, the clubs and houses in Pall Mall would have shown their bravest "lines of festal light." For just a hundred years before vast crowds had assembled in Pall Mall to gaze at a row of gas-lamps which a certain German, named Winsor, had set up in front of the colonnade before Carlton House, in honour of King George III.'s birthday. . . . These were practically the first gas-lamps seen in London, though Murdoch, a Scotsman, had made some tolerably successful experiments a few years before, and Watt and Boulton's factory at Birmingham had blazed with gas in 1802, on the occasion of the Peace of Amiens. Even the Carlton House exhibition, however, failed to convert the scoffers, learned as well as unlearned, for in 1809 Sir Humphry Davy declared that it would be as easy to bring down a bit of the moon to light London with as to light it with gas. With like fatuity some scientists spoke of electricity as a mere toy of the laboratory, not foreseeing the tall arc lamps of our own day, which outshine the very moon herself. The first gas-works failed miserably; and in 1813 two people were actually prosecuted for endangering the health of the lieges by "the making of gas-light." But a year later the battle was won, and the general lighting of the Metropolis by the new illuminant began. Grosvenor Square was the last home of the lost cause. . . .

Gas has done wonders for London; and it will do still more. There were those who thought that its doom was written when its more sparkling younger sister appeared on the scene. But rivalry has only disclosed its latent possibilities. Without entering into any comparison of the relative values of gas and electricity as an illuminant for the public streets, it is undeniable that some of the best-lit thoroughfares of London owe their brightness to gas, in the new guises which it has put on during the last few years. Improved processes are continually being discovered. The call of the public is always for more light, and the great streets of London are now simply radiant in these winter nights. . . . People exiled from home have been known to long even for the golden gleam of yellow gaslight that beautifies a dripping London pavement. Gas and electricity are turning night into day. Only the foolishly adventurous set off for the Land of the Midnight Sun; it is here in London all the year round. Some of its effects may not be altogether desirable. It is an enemy of the "beauty sleep." It tends to keep people up later than is good for them. It is partly responsible for the increased whirl and rush of modern life. It has added on an hour or two to the day, by docking them from the period apparently meant for repose. But, on the other hand, the benefits it has conferred are incalculable. A well-lighted city is, nine times out of ten, a city well administered. That is one of the salient tests of good government. And just as sunlight kills the lurking germs of disease, so light of all kinds is the greatest foe of vice, crime, and all the evil things that skulk in the dark corners of a great city. Money wisely spent on street illumination is money saved. The slums need to be lit up just as much as the main thoroughfares; and when they are thus lit, they cease to be slums. Their inhabitants flee from the light like the crawling insects which haste to hide themselves anew when one has turned over the stone under which they had made their habitation. *Fiat lux.* Pall Mall ought certainly to have kept its centenary last night.

MR. HERRING ON THE GAS SUPPLY OF EDINBURGH.

The Use of Incandescent Burners in the City.

Last Friday evening, the first of a series of lectures upon municipal matters, promoted by the Corporation of Edinburgh, was delivered to a very large audience in the Synod Hall, Edinburgh, by Mr. W. R. HERRING, the Gas Engineer, who took for his subject "The Gas Supply of the City."

Bailie MAXTON, who presided, intimated an apology for absence on behalf of Lord Provost Gibson, who had another engagement, and introduced the lecturer, stating at the same time that other lectures by the principal Corporation officials, would be delivered at intervals of a fortnight, by which, it was hoped, the citizens would obtain a better knowledge of the work of the city.

Mr. HERRING said he had had some difficulty in compressing his subject so as to bring it within the scope of one short lecture, and he could only hope to convey to the audience a general impression of the character and extent of the gas undertaking. In the course of a short historical account of gas supply, he said it was rather coincident that he should appear before them that night, practically a hundred years after the introduction of gas lighting in the streets of London; for it was on the 27th of January, 1807, that Pall Mall was first illuminated with coal gas, a distinguished company being gathered together to witness it, and, according to the records of "The Times," they were greatly impressed and much pleased with it. In 1814, coal gas made its first advance as an organized movement. The first definite step in the direction of affording a supply of gas to Edinburgh was made in the year 1816, in the establishment of the Edinburgh Gaslight Company. In November of that year, the Company applied for, and obtained, early in 1817, permission from the Town Council to open the streets and lay pipes. The Company was incorporated on March 1, 1817; and the 17th of the same month it was resolved to make application to Parliament for an Act to charter their existence. Constructional works were, however, commenced upon the present site of the New Street Works, in May of 1817, before the Act was obtained; and a gas supply was distributed to the citizens in April, 1818. The Company was not permitted to occupy the field alone, for they found in 1823 the Leith Gas Company starting in opposition; their intention being to supply oil gas. The Leith Company, evidently finding oil gas was unsuitable or unprofitable, obtained the sanction of the Town Council to lay mains throughout the district under the jurisdiction of the City Corporation, in order to supply coal gas in competition with the Edinburgh Company. In 1824, the Edinburgh Oil-Gas Company (ostensibly for the portable supply of compressed gas) was inaugurated, of which Sir Walter Scott was Chairman; this Company being ultimately absorbed by the Edinburgh Gaslight Company. From this date onwards, there appeared to have been considerable rivalry between opposing concerns, and particularly the Edinburgh and the Edinburgh and Leith Companies, both of whom displayed considerable energy in canvassing for customers and winning the public favour. This policy resulted in the laying of duplicate supply-pipes in the principal streets in Edinburgh; and while the citizens must have suffered considerable inconvenience in consequence of the disturbance of the streets, the public did not appear to have derived any advantage from the competition, as, he understood, the price charged for gas was the same by both Companies. In 1866, the Companies appeared to have realized the suicidal policy of competing for the public favour; and consequently they entered into a formal agreement whereby the district was apportioned in such a way as to avoid the open competition that had hitherto prevailed. Though, at the outset, the agreement was little more than a formal undertaking entered into between the parties, its conditions appeared to have been carried out up to the time of the transfer—and, in fact, it formed the principal subject of the Bill which the Leith Company promoted in Parliament at the same time that the Municipal Bill was being considered.

After a narrative of the proceedings which culminated in the transfer, Mr. Herring said it was not necessary to pursue in detail the controversy that prevailed at the time. It might not, however, be altogether inopportune for him to express an opinion as to the bargain then entered into. From his knowledge of such affairs, he could emphatically say that the two Corporations made an excellent bargain at the time. Then followed a description of the constitution of the Gas Commission, and their statutory powers, financial and administrative, after which the lecturer went on to say that since the transfer of the undertakings in 1888, the business of gas supply had increased by 50 per cent., the gas consumers had increased from 62,000 to 92,000, and the gas output had augmented proportionately. At the time of the transfer, the price of gas was 3s. 6d. per 1000 cubic feet, with coal at about the same price as at present. To this extent, therefore, the consumer could gauge the advantages of municipalizing this particular concern, especially when he reminded them that the reduction of 9d. per 1000 cubic feet represented an annual saving on the gas bills of some £72,000. The administration of the undertaking involved a turnover of more than half-a-million of money per annum. Nearly 200,000 tons of coal were now employed for producing the gas demanded by the public. During the winter period, 1000 tons of coal were used per day, and 10½ million cubic feet of gas were sent out. This represented a total illumination of 315 million candles for the 24 hours. A single hour's consumption during the winter afternoons required a million cubic feet of gas, which was capable of yielding a light of 30 million candles. This quantity of gas was distributed among the 92,000 consumers by means of 400 miles of main pipes, which would reach from Edinburgh to London, if stretched in a single line, to say nothing of the 800 miles of service-pipes leading the gas from the mains to the consumers' meters.

Mr. Herring went on to point out that the construction of entirely new manufacturing works at Granton, and the abandonment of the three old stations in Edinburgh, Leith, and Portobello, were rendered necessary by the increasing demand for gas. Notwithstanding the introduction of their fair competitor, the electric light, the consumption of gas continued to increase; and, in the opinion of those best able to judge, it was likely to do so for very many years to come. The

condition of the plant at the old manufacturing stations was such as to make it impossible to extend or reconstruct them economically; and after most mature consideration on the part of the Commissioners, it was found that a new scheme was urgently required. It was predicted at the time that such a scheme would not increase the burden upon the gas consumers; but, on the other hand, it was anticipated that it would lighten it. As the result had proved, it had lightened the burden to the extent of £24,000 per annum, this sum being represented by the reduction in the price of 3d. per 1000 cubic feet which was granted immediately after the new works were opened. The gross profits resulting from the annual operations had been increased from £38,000 in 1896 to £91,000 in 1906; the price of coal remaining approximately the same in each period of comparison. This increase of profit had not been obtained at the expense of the workers' wages; for since 1900 these had been increased, on an average, 8·64 per cent. The great scheme, therefore, which had now been completed, so far as the present demanded, had been carried out without cost to the consumer or to the ratepayer. It was being paid for out of profits resulting from the employment of modern plant and modern methods. In order to convey some idea of the character of the works and the extent of the operations at Granton, he proposed, with the aid of limelight views, to show and to briefly describe, its principal features, from which, he thought, the audience would be able to see where some of the economy was being brought about, as well as appreciate the advantages which had accrued to the operatives; for though they now employed only about one-third of the men formerly required, the tax upon their physical energy was very considerably less than it used to be with the old methods—in fact, the guiding principle in the construction of the works had been that brains, and not muscle, should be the controlling factors.

Twenty-three lantern slides were exhibited on the screen, illustrating the principal features of the Granton works, and explanations were given by the lecturer, following which a demonstration of lighting efficiency by ancient and modern methods concluded the lecture. A number of worn-out flat-flame burners were started. These gave a very poor light; but by placing a hood over them, the lighting was greatly improved. The contrast between flat-flame and incandescent burners was also illustrated. In the course of showing these lighting effects, Mr. Herring said he had arranged that men would be at the doors of the hall, and, on leaving, the audience would get one of the hoods, so that they could try them for themselves. The point at issue at present was whether they should continue to burn gas by flat-flame burners. It was all very well to do this when they had no other method of burning it; but to-day they had, within the reach of everybody, one which would give them eight times more light. He had been at some pains to ascertain the extent of the use of incandescent burners in their district. He had taken a census during the present survey of the meters, which, unfortunately, was not yet complete; but up to the previous day it showed that 75 per cent. of customers were using gas otherwise than by the flat-flame burner; and 65 per cent. of them were employing incandescent burners. This meant a majority of the gas consumers. They had at times heard it said that the incandescent mantle was not suitable for the working man's kitchen. That would show them how the working man answered the question. Up to date, they had examined 27,000 meters in working-class districts, and of these, 17,000 were utilizing the gas by incandescent burners. He had no doubt, when they had completed their census, they would have the strongest evidence possible to justify the Commissioners in adjusting their methods of manufacture to modern requirements. The audience would have observed that the vestibule and corridors of the hall had been fitted up with incandescent burners. He wished to emphasize the fact that those who desired to continue to burn gas could get a most efficient light by it.

On the motion of ex-Bailie STEVENSON, lately Convener of the Electric Lighting Committee of the Town Council, a vote of thanks was accorded to Mr. Herring. He said they were all agreed that in Mr. Herring they had one of the most advanced and most expert men in the country in connection with gas undertakings; and that at Granton they had gas-works which were not only a credit to the city, but to the inventive genius of Mr. Herring.

A NEW PURIFIER-HOUSE FOR CAMBRIDGE.

Progress of the Gas Company.

The Cambridge University and Town Gaslight Company are contemplating the reconstruction of their purifier-house, at an expenditure which was estimated by the Chairman (Mr. E. H. Parker), at the recent half-yearly meeting of the shareholders, to be between £6000 and £7000. In calling attention to the matter, he said that the old purifying-house was of bad construction, and was, no doubt, a weak point. Unless purifying-houses were well constructed, and well ventilated, they were a source of danger, and the work proposed had really become urgent.

With regard to the business of the Company during the six months to Dec. 31, the Chairman said the Directors were again able to congratulate the shareholders on the satisfactory state of their business. There was a decreased profit on the half year of £286; but this was after reducing the price of gas by 2d. per 1000 cubic feet, which meant about £1000. So the fact that their figures only showed a decreased profit of £286, proved that there had been a large increase in the business. The capital account was £2309 overdrawn; and the Directors were going to ask for power to issue at their discretion £10,000 of ordinary stock and £2500 on loan or debentures. It was not intended to issue all the £10,000 at once; but the Board were of opinion that, when taking powers, they had better take powers for a sum which would last for several years. Some time this spring, they would offer for competition perhaps about £3000 of stock. The balance which would be carried to the profit and loss account from the revenue account was £6162, which was sufficient to pay maximum dividends on the three kinds of stock (amounting to £5112), and to pay the mortgage interest (£579), leaving a balance of £471 to the credit of the profit and loss account. As showing the continued prosperity of the Company, it might be mentioned that the ordinary consumers had increased by 108, ordinary cookers by 76, heating appliances by 51, slot-meters by 222, and slot-cookers by 184. These were all perfectly satisfactory increases; and another gratifying feature was the amount of gas which had been obtained from each ton of coal carbonized. In the past half year they had secured no less than 11,323 cubic feet per ton. This was a very good result; and great credit was due to their Engineer and Manager (Mr. J. W. Auchterlonie) and the carbonizing foreman under him.

The report was adopted; and the Directors were subsequently authorized to raise additional capital, as suggested by the Chairman in the course of his remarks.

GAS-WORKS PROFITS AND THE RATES.

The Question Raised at Spalding and Congleton.

The disposal of the profits accruing from the gas-works has been engaging the attention of the Spalding Urban District Council, in consequence of the action of the Local Government Auditor (Mr. J. A. Cole) in surcharging two members with £1000, which was appropriated towards a reduction of the general district rate. The members concerned were those who signed the cheque for the amount. Until recently, the Board ruled that the profits earned by the undertaking must either be spent on improving the works or be absorbed by a reduction in the price of gas. When, however, the charge for gas came as low as 2s. 6d. per 1000 cubic feet, there was a general feeling that the rates ought to benefit from the success of the concern; and accordingly the Council applied for a Provisional Order to enable them to devote the surplus profits in this way. The Order was obtained; and during the year ending March, 1905, £920 was apportioned to the relief of the rates. This was passed by the Auditor in due course; and so for the twelve months to March last £1000 was voted in a similar manner. Upon the Auditor paying his next visit, however, he refused to allow the item. A lighting rate is levied in the district; and until this is extinguished, the Auditor contends that nothing must go to the district rate. The clause in the 1903 Order on which the point turns is this—

> The residue (if any) of such revenue shall be applied first in reduction of the gas-rate levied under the Local Act, and secondly shall be carried to the credit of the improvement rate levied under that Act; but no part of such revenue shall be carried to the improvement rate when the price to ordinary consumers exceeds 3s. 4d. per 1000 cubic feet.

The matter was referred to the Local Government Board, who replied that they saw no reason to interfere; and the Auditor thereupon confirmed his ruling. There the matter rests at present.

At Congleton, also, there is a desire to relieve the rates by means of profits from the gas-works, which it seems cannot be gratified under existing conditions. At the last meeting of the Town Council, the Town Clerk (Mr. E. A. Plant) submitted a letter from the Board stating that they had carefully considered the representations contained in the statement in support of the application of the Council for a Provisional Order to amend the Congleton Gas and Improvement Act, 1866, and the Provisional Order of 1904, so as to enable the Corporation to devote the surplus gas revenue to the borough fund or general district rate, as the Corporation should from time to time decide; but as the Board did not think a sufficient case had been shown for issuing a Provisional Order, they were not prepared to entertain the application.

Reduction in Price at Fenton.—The Fenton Gas Committee have reported to the Urban District Council their decision that the price of gas should be reduced by 3d. per 1000 cubic feet to all consumers from April 1 next. The gas will then be charged at the rate of 3s. 4d. per 1000 feet, and be subject to a rebate of 10d. if paid within one month from the date of the demand-note. Gas for motive power, where the consumption is not less than 250,000 cubic feet a year, will be subject to a rebate of 1s. 1d. per 1000 feet, if paid within the month.

Supply of Gas as a Stand-By.—A correspondent asks if any of our readers can inform him whether a gas company working under the Gas-Works Clauses Acts are called upon to supply gas for stand-by purposes. He knows of a case where suction-gas plant has been put in, and a supply of coal gas is asked for in order that it may be utilized in the event of the plant breaking down. He says clause 11 of the Gas-Works Clauses Act, 1871, hardly seems to cover the case from the gas company's point of view; but whether it does so or not, under their Private Act they are only called upon to supply gas at 8-10ths pressure at the service, and therefore the gas-engine would come off badly. Our correspondent adds that particulars as to the practice of others on this subject will be much esteemed by him.

Dynamite Explosion in the Edinburgh Gas-Works.—On Tuesday last, two men named Angus M'Kay and Peter Campbell, were injured by an explosion of dynamite at the old gas-works in New Street, Edinburgh. In connection with the litigation with reference to the pollution of a brewery well, the Commissioners are engaged in driving mines, with the view to tracing the source of the pollution. Blasting by means of dynamite has been carried on for some time, ignition of the charge being obtained by an electric current derived from a battery on the surface. Holes having been drilled, and the charges inserted, with an accompanying fuse, and the cable attached, the men were withdrawn from the mine and the battery connected. The shots did not come off; and after the lapse of a minute the battery was disconnected. A man named Murdoch, who was in charge of the work, and Campbell, descended the mine and disconnected the cable from the fuse, for the purpose of testing the cable. Murdoch then returned, leaving Campbell below. On reaching the surface, he switched on the battery and sent M'Kay down to assist Campbell in finding the defect. The end of the cable was found to be defective. It was cut off, and, without acquainting Murdoch, Campbell applied the cable to the fuse, which ignited. Both men were rather badly injured, and were taken to the Royal Infirmary. Towards the end of the week, however, they were reported to be recovering as well as could be expected.

GAS v. ELECTRICITY AT DEVONPORT.

There is every prospect of a very keen contest between the Gas and Electricity Departments of the Devonport Corporation when the Town Council of the borough meet next week. Both are desirous of the credit of lighting the main thoroughfares of the town; and the battle between the advocates of the two methods of illumination seems likely to be waged with exceptional vigour. For a considerable time the subject has been under the consideration of a Special Committee representing the gas and electricity undertakings and the department which has control of the streets. When the electricity works were erected, the lighting of the principal thoroughfare—Fore Street—with electric arc lamps was decided upon with practical unanimity. Electric cables were also laid in the adjoining streets, and efforts have been made from time to time to induce the Council to consent to the erection of arc lamps in these streets as well. In the meantime, however, the Gas Department has been pushing its claims, and carrying out costly and successful experiments. A high-pressure installation on the Keith system has been laid down in one street; another was lighted with Welsbach self-intensifying lamps; and a third with Sugg's double burners. The Electricity Committee, on their part, replaced the arc lights in Fore Street with modern "flame" arcs, for which an illuminating power of 2300 candles is claimed, and suggest the erection of similar lamps in the thoroughfares which are the subject of controversy. The final decision on the matter appears likely to be influenced by the question of cost. Hitherto the Electricity Committee have charged £22 10s. per annum for each of the 17 arc lights in use in Fore Street. They now propose to put up 40 more flame arcs, and to charge for them (including those at present in use) a uniform price of £12 10s. each per annum. The Gas Committee's proposal is to light the important thoroughfares with triple Kern burners in modern lanterns. Each of these will give an effective illumination of 420 candles with a consumption of 15 cubic feet of gas per hour; and the cost per lamp will be £6 4s. 8d. per annum. Excluding Fore Street, which it is agreed shall continue to be lighted by electricity, there would be 64 of these improved gas-lamps, as against the 40 arc lights proposed. The cost for the streets of which the lighting is in question would be, therefore, £500 per annum for electricity and £399 for gas. On the ground that gas lighting is more economical, the Special Committee have recommended that gas should be adopted; and this recommendation is endorsed by the Surveyor's Committee. The Electricity Committee will, however, endeavour to persuade the Council to reverse this decision; and a good deal, no doubt, will be said as to cost per candle power, and also as to the reduction of the cost of lighting Fore Street, which would result from the extension of electric lighting and the lowering of the present charge of £22 10s. per lamp to £12 10s. Outside the area where the electricity cables are laid, incandescent gas lighting is being steadily extended. There are 1100 gas-lamps in the borough, and before next Christmas all the old flat-flame tips will be replaced by incandescent burners.

METROPOLITAN WATER BOARD.

The first Meeting of the Board after the Christmas recess was held last Friday, under the presidency of Sir Melvill Beachcroft, the Chairman. The Finance Committee, in a long report, set forth a scheme for placing the collecting staff of the Board on fixed salaries in lieu of commission, with a view to greater uniformity, efficiency, and economy; and their proposals were adopted.

The Water Examination Committee presented a report on the results of the chemical and bacteriological examination of the London waters for the twelve months ended the 31st of October last, by Dr. A. C. Houston, the Director of Water Examinations to the Board, who stated that during the period named (which is the first completed year since the establishment by the Board of their own scientific department for the examination of the London waters), 11,487 samples had been examined, exclusive of 529 collected for special purposes. In the course of some provisional conclusions at the end of the report, Dr. Houston said that no praise could be bestowed on the qualities of the raw waters, which were known to be contaminated with sewage. But as regards the water actually sent out for consumption, the case was different. The processes of subsidence and filtration effected the almost entire removal of the suspended matters, reduced the colour to a marked extent, and brought about a great reduction in the original amount of organic matter. Bacteriologically the total number of microbes was reduced about 98 per cent. It was important, he urged, that the extension of storage capacity and of filtration area should more than keep pace with the increased rate of consumption of water; and it was equally important that the pollution of the raw waters should be so controlled in the future that the total impurities entering the rivers should tend to diminish rather than to increase in quantity. It was also obvious, considering the question apart from any existing limiting regulations or engineering difficulties, that it would be desirable to be able to abstract an unlimited amount of raw Thames water, whenever the conditions (physical, chemical, and bacteriological) were specially favourable for storage purposes, subject, of course, to the maintenance of a minimum, but adequate, flow of water down the river.

The return relating to the supply of water for the month of December showed that the total average daily supply was 209,503,000 gallons. The number of houses, &c., supplied was 1,058,000; the estimated population being 6,872,768, and the mean supply per head per day 30·4 gallons, compared with 29·9 gallons, the corresponding figure for December, 1905. The quantity of water in store in impounding reservoirs at the end of the month was 7164 million gallons, against 6150 million gallons at the end of December, 1905.

Sale of Gas Stock.—At a recent sale by auction, £160 of stock in the Elland-cum-Greetland Gas Company realized £240; while £280 of stock in the Otley Gas Company was disposed of at £125 per £100.

GREAT YARMOUTH WATER BILL.

Statement by the Directors of the Company.

In the course of a statement which the Directors of the Great Yarmouth Water Company have prepared for consideration by the Town Council, on the subject of the Bill which is now being promoted, they point out that a further supply of water will be essential to the progress and prosperity of the town; and after the most careful inquiry, they find there is no better available source than the Bure. If this source of supply should unfortunately be closed to Yarmouth, they do not see whence the water needed in the near future can be obtained.

The scheme proposed at the present time, the Directors say, differs in several very important respects from that brought forward last year. It establishes the following additional important safeguards for the purity of the water: (1) They propose to obtain power to put in force the Rivers Pollution Acts. (2) To agree with the riparian owners to prevent pollution. (3) To provide a sedimentation basin—a water-tight reservoir—on high ground. (4) To provide also double filtration, employing a method not hitherto used at Ormesby. With regard to these proposals, the application of the Rivers Pollution Acts would be to the upper part of the Bure, and would in no respect affect the river near Yarmouth. The possession of the powers conferred by these Acts, which the Company are authorized to put in force at Ormesby, has been attended with satisfactory results. At Norwich, the period for sedimentation provided—where the supply is also from a river, the Wensum, the condition of which is stated to be practically identical with that of the Bure—is only for three-quarters of a day's consumption. At Yarmouth, five days' consumption would be provided.

The necessity for securing a further supply in the near future is, the Directors remark, obvious when it is considered that the demand is now for 460 million gallons a year, and that the annual increase is about 10 million gallons; while the supply provided by Ormesby must be limited. With regard to the connection with Lowestoft, the scheme originated with the Yarmouth Company; the Lowestoft Company subsequently consenting to co-operate. The arrangement is one of mutual advantage. For both places an additional supply will be needed; and, by combining, they will obtain what they require at less cost. Lowestoft is merely a very good customer, and does not obtain any authority over the Yarmouth works. The Directors have had the supply of water from wells under their careful consideration; but their engineers and geological advisers warn them that wells from the chalk are not available.

In order to avoid interfering with the yachts which frequent the river and the traffic generally, a close time would be agreed on, when water would not be pumped. The Bill has the approval of the Yarmouth Port and Haven Commissioners. The Directors do not look for any special pecuniary advantage from the extension; but they feel that no other course than that proposed is open to them, to enable them to provide the supply required by the town.

THE CHARGE FOR WATER IN LONDON.

Objections to the Water Board's Bill.

At the Meeting of the London County Council on Tuesday, the report of the Parliamentary Committee on the subject of the Bill which the Metropolitan Water Board have promoted for next session to alter the charges for water, to which reference was made last week (p. 295), was presented, and its adoption moved. Thereupon Sir J. Benn, M.P., moved an amendment to add to the recommendation to oppose the Bill words to the effect that the Borough Councils should be invited to join with the County Council in resisting the proposed addition to the water charges of London. He protested against water ratepayers throughout London being compelled to pay under this scheme at least £10,000 a year more than at present, in order to relieve those who were outside its borders. He thought the Water Board should first seek to equalize the basis of rateable value. When this was done, he could see no objection to equalizing the water-rate. Mr. Radford, M.P., said the Council would only weaken their position by inviting the petty local authorities of London to co-operate with them in this opposition. Sir Melvill Beachcroft said that what the Board wanted was a periodical revaluation of property outside London. The County of London would not have to pay any extra charge unless there was a deficiency rate; and this was hardly likely to occur when the estimated surplus of the Board for this year was £49,000. The Board were under statutory obligation to produce a unification scheme before they had had full time to estimate the difficulties of the situation. Mr. H. P. Harris thought the Council might well co-operate with the Local Authorities of London in this matter, and see where the Bill required amendment in the interests of London. After further discussion, the amendment was carried in an altered form. Under it the Parliamentary Committee were authorized to communicate with the Borough Councils with a view to obtaining their co-operation in resisting the increased burden the Bill proposed to put upon London, to the relief of ratepayers outside. The recommendation as amended was then adopted.

On the same day, the City Board of Guardians held a meeting, at which Mr. W. H. Wagstaff, the Chairman of the Assessment Committee, made a statement bearing upon the effect of the Bill above referred to upon the City. He said its provisions would destroy the basis of assessment adopted for many properties. The promoters proposed a water-rate which should not exceed 5 per cent. of the rateable value. In the City, the present payment for water was at the rate of 3 per cent. on the rateable value of premises over £200 per annum, and 4 per cent. in the case of those under this amount. The Committee, in fixing the net rateable value, deducted from the gross rentals sums to represent rates, taxes, lighting, housekeeper, water, &c. Included in the deductions was the water-rate based upon the 3 per cent. and 4 per cent. scale. Should the proposed 5 per cent. scale become operative, the effect would be to reduce the net rateable value of (say) a property of the gross rental of £228,895 from £127,164 to £125,068. With

rates at 7s. in the pound, there would therefore be a saving in this case of £733 per annum; while it would also be noted that the 5 per cent. water-rate would be paid on £2096 less rateable value—another saving of £104 for the ratepayers. Taking the net rateable value of the City on April 1 next at £5,373,276, and applying to it the same principle, the reduction would be £67,356, which, with rates at 7s. in the pound, represented a saving of £23,574 per annum to the ratepayers, and a further saving of £1346 per annum on the payment for water-rate. There would ensue a reduction in the amount collected in the City for the consolidated rate, the proportion of rates payable to the London County Council, the Metropolitan Asylums Board, the equalization rate, and the Metropolitan Common Poor Fund. The reduction would also in some measure jeopardize the accuracy of the financial calculations of the Bill. This could not be a matter of unconcern to the City, when it was realized that the new scheme, in its first year, showed an estimated deficit of £21,000, which deficit would be considerably accentuated should a reduction in rateable value become general. The question was the more important because the Water Board had power to levy a general rate, in addition to the water charges, to meet any deficit; and should this power be utilized, all property in the City would have to pay the rate, whether water was consumed or not. A further hardship would be inflicted upon the ratepayers from the fact that leases and agreements could not be amended to meet this new outlay. The Committee suggested that steps should be taken to insert a clause making the change operative from the date of the next quinquennial revision, or, failing this, to remove all doubts by inserting provisions enabling assessment authorities to act.

Metropolitan Gas Company of Melbourne.—The profits of this Company for the half year to Dec. 31 were £57,500. A dividend of 5s. per share has been declared for the six months, a sum of £14,500 has been added to the reserve fund, and £2500 carried forward.

A Brighton Gas Poisoning Case.—A Brighton hairdresser named Bennett was last Saturday week found lying dead in his bedroom; and it was discovered that a gas-tap was turned full on, while a cork which had been fitted into the dead-end of the pipe had fallen out. A theory advanced at the inquest was that during the night the plug blew out of the dead-end; and the deceased, detecting the escape of gas, fancied it was from the gas-lamp, and, in mistake, turned the tap on. A verdict of "Death from misadventure" was returned.

New Joint-Stock Companies.—The Tar Patents Solidifying and Distilling Company, Limited, has been registered with a capital of £10,000, in £1 shares, to adopt an agreement with the Tar Patents Solidifying Syndicate. As mentioned in the "JOURNAL" last week, the South Luton District Gaslight and Coke Company, Limited, has been formed, with a capital of £30,000, in £5 shares (3000 preference), to adopt an agreement with the Gas-Works Extension Corporation, Limited, for the acquisition of the Markyate Gas-Works. The minimum cash subscription is 10 per cent. of the shares to be offered to the public. The first Directors are Messrs. N. Wilkinson, E. Jarvis, and J. K. Abel-Knapton. The Crail Gas Company, the registered office of which is at 58, Nethergate, Dundee, was registered in Edinburgh last week, to take over the undertaking of the Crail Gaslight Company. The capital is £1000, in £1 shares—the same as in the old Company. The public are not asked to subscribe.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

At the monthly meeting of the Edinburgh and Leith Gas Commission on Monday, it was reported that the revenue of the Commission between Whitsunday and Jan. 7 had amounted to £174,223. Between May 16 and Dec. 15 the gas-rental amounted to £95,229—an increase of £5951 over the corresponding period of the previous year. The output of gas during December showed an increase over the same month of 1905 of nearly 16 million cubic feet; and since May 16 there has been an increase of over 45 million cubic feet.

Mr. W. R. Herring delivered a popular lecture upon the gas supply of the city in Edinburgh last night, a summary of which is given elsewhere. It was a clearly expressed deliverance, and must be of much service to the community in bringing to their notice a fact which they are like to lose sight of, that there is something good in gas lighting—much better than most gas consumers think.

The visit of the Eastern District Juniors to the Glenboig Fire-Clay Works this afternoon was a fitting round-off to the previous week's visit by the members of the Western District to similar works at Bonnybridge. To-day's visit, notwithstanding that the footing was upon snow and ice, and in places mud, and that there was a cold foggy atmosphere, was a very happy one. This was to be attributed to the warmth of the reception which was accorded to the visitors by the officials of the Company; and to the amount of information which they so freely imparted. The works at Glenboig are very extensive, and bear every trace of their not having been built upon any preconceived plan, but of having grown with the development of the business—bit having been added to bit as necessity arose. On the return journey, the remark was made that the members of the Association who do not take advantage of the opportunities afforded of visiting works of interest to makers of gas are not aware of the amount of loss which is theirs. When at the works, attention was called by one of the visitors to the cosmopolitan nature of the Company's attitude towards lighting questions. The workshops are lighted with oil gas, the yards with electric arc lamps, the offices with electric incandescent and paraffin lamps, and the Workmen's Institute with acetylene gas.

Many people are disposed to cry out before they are hit. Surely that is the disposition of a writer, apparently one of the staff, in the "Dundee Advertiser" of yesterday. Dealing with the price of coal, he recalls that it has already risen 2s. 6d. per ton. He anticipates a further rise of 1s. per ton, and reaches the conclusion that corporations, in respect of the production of gas, are feeling the effects of the enhanced quotations. There is comfort to the writer that, in this respect, they have fared well in Dundee, the whole of the coal for gas purposes having been contracted for till April. But there is a sad outlook for them, because, if, as is expected, another 1s. is to be added to the price of coal before existing contracts expire, the effect on the cost of gas will be pronounced. He reasons that every 1s. per ton advance in the price of coal represents an increase in the coal bill of some £3500 per annum, equal to 1d. per 1000 cubic feet of gas produced; and, assuming that, by the end of April, coal is 3s. 6d. per ton dearer than it was last year, the coal supply will cost £12,250 more than the figure for the current twelve months—and "in that event, it will be

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 331.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	21—22	+½	4 15 5
245,112	10	,,	7½	Do. 7 p.c.	14½—15⅝	+½	4 16 9
200,000	5	Nov. 14	7	Bombay, Ltd.	6¾—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5—5⅜	..	5 1 10
50,000	10	Aug. 30	14	Bourne- mouth Gas and Water } 10 p.c.	28—29	..	4 16 7
51,810	10	,,	7	B 7 p.c.	17—17½	..	4 0 0
53,200	10	,,	6	Pref. 6 p.c.	15—16	..	3 15 0
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	262—267	..	4 13 8
300,000	,,	,,	9½	Do. New	200—205	..	4 12 8
50,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb.	101—104	..	3 16 11
220,000	Stk.	Sept. 27	11½	Brighton & Hove Orig.	232—237	..	4 14 11
246,320	,,	,,	8¼	Do. A. Ord. Stk.	163—168	..	4 18 3
460,000	20	Sept. 27	10	British	42—43	..	4 13 0
104,000	Stk.	Aug. 15	6	Bromley, Ord. 5 p.c.	121—125	..	4 16 0
165,700	,,	,,	4½	Do. do. 3½ p.c.	91—94	..	4 15 9
500,000	10	Oct. 12	7	Buenos Ayres (New) Ltd.	11¼—12	..	5 16 8
250,000	Stk.	Dec. 13	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
150,000	20	July 12	8½	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	14—15	..	6 13 4
100,000	10	Oct. 26	4½	Do. 4½ p.c Pref.	8½—9½	−½	4 14 9
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	50—52	..	5 15 5
50,000	Stk.	Dec. 28	4½	Do. 4½ p.c. Deb. Stk.	96—98	..	4 11 10
157,150	Stk.	Aug. 15	5	Chester 5 p.c. Ord.	108½—110½	..	4 10 6
1,443,280	Stk.	Aug. 30	5½	Commercial 4 p.c Stk.	110—113	..	4 12 0
560,000	,,	,,	5	Do. 3½ p.c. do.	108—111	+1	4 10 1
475,000	,,	Dec. 13	3	Do. 3 p.c. Deb. Stk.	83—85	..	3 10 7
800,000	Stk.	,,	6½	Continental Union, Ltd.	124—127	..	5 2 4
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—143	..	4 17 11
432,070	Stk.	Aug.	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	,,	July	4	Do. Deb. Stk.	105—107	..	3 14 9
486,090	10	Jan. 31	11	European, Ltd.	24—25*	..	4 8 0
354,060	10	,,	11	Do. £7 10s. paid	17½—18½*	..	4 9 2
15,203,110	Stk.	Aug. 15	4⅛	Gas- light and Coke } 4 p.c. Ord.	97—99	−3	4 8 11
2,600,000	,,	,,	3½	3½ p.c. max.	90—92	..	3 16 1
3,799,735	,,	,,	4	4 p.c. Con. Pref.	107—110	..	3 12 9
4,193,975	,,	Dec. 13	3	3 p.c. Con. Deb.	84—86	..	3 9 9
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	98—103	..	4 17 1
82,500	,,	,,	6½	Do. do. 5 p.c.	118—121	..	5 7 5
70,000	10	Oct. 12	11	Hongkong & China, Ltd.	19½—20½	..	5 7 4
4,940,000	Stk.	Nov. 14	8	Imperial Continental	182—185	+1	4 6 6
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 2
183,242	Stk.	Aug. 30	6	Lea Bridge Ord. 5 p.c.	120—125	..	4 16 0
306,083	,,	Dec. 28	4	L'rpool Unit'd Deb. Stk.	108—110	..	3 12 9
561,000	Stk.	Aug. 30	10	Liverpool United A	226—228	..	4 7 9
718,100	,,	,,	7	Do. B	167½—169½	..	4 3 1
144,140	Stk.	Sept. 13	7⅞	Maidstone 5 p.c.	145—150	..	5 1 8
75,000	5	Nov. 29	5	Malta & Medn., Ltd.	4¼—4⅜	..	5 5 3
560,000	100	Oct. 1	5	Met. of } 5 p.c. Deb.	101—103	..	4 17 1
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	Nov. 14	3¾	Monte Video, Ltd.	11½—12½	..	5 12 0
1,675,892	Stk.	Aug. 15	4⅝	Newc'tle & G'tesh'd Con.	110—111	..	4 3 4
406,025	Stk.	Dec. 28	3½	Do. 3½ p.c. Deb.	96—97	..	3 12 2
15,000	10	Aug. 30	10	North Middlesex 10 p.c.	20—21	..	4 15 3
55,940	10	,,	7	Do. 7 p.c.	13½—14½	..	4 16 7
300,000	Stk.	Nov. 29	8	Oriental, Ltd.	150—155	..	5 3 3
60,000	5	Sept. 13	7	Ottoman, Ltd.	6—6½	..	5 7 8
398,490	5	Oct. 26	7	Primitiva Ord.	7⅞—8⅛	..	4 6 2
796,980	5	Jan. 31	5	Do. 5 p.c. Pref.	58—58*	..	4 13 0
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
851,070	10	Oct. 12	7	River Plate Ord.	12¼—12⅝	..	5 7 8
300,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
250,000	10	Sept. 27	8	San Paulo, Ltd.	13—13½	−¼	5 18 6
70,000	50	Jan. 2	5	Do. 5 p.c. Deb.	48—50	..	5 0 0
135,000	Stk.	Sept. 13	10	Sheffield A	248—250	..	4 0 0
209,984	,,	,,	10	Do. B	248—250	..	4 0 0
523,500	,,	,,	10	Do. C	248—250	..	4 0 0
70,000	10	Oct. 26	10	South African	15⅜—16⅛	..	6 1 3
6,350,000	Stk.	Aug. 15	5⅛	South Met., 4 p.c. Ord.	128—130	..	4 4 7
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	84—86	..	3 9 9
201,720	Stk	Sept. 13	8	South Shields Con. Stk.	158—160	..	5 0 0
575,000	Stk.	Aug. 15	5½	S'th Suburb'n Ord. 5 p.c.	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	123—126	..	3 19 4
112,533	,,	Jan. 16	5	Do. 5 p.c. Deb. Stk.	125—130	..	3 16 11
502,310	Stk.	Nov. 14	5	Southampton Ord.	107—112	..	4 9 3
120,000	Stk.	Aug. 30	6½	Tottenham } A 5 p.c.	127—130	..	5 0 0
388,020	,,	,,	5	and } B 3½ p.c.	104—106	..	4 14 4
137,500	,,	Dec. 28	4	Edmonton } 4 p.c. Deb.	101—103	..	3 17 8
182,380	10	,,	8	Tuscan, Ltd.	10⅝—11	..	7 5 6
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	102—104	..	4 16 2
193,742	Stk.	Sept. 13	5	Tynemouth 5 p.c. max.	106—108	..	4 12 7
30,000	Stk.	Aug. 15	8	Wands- worth and } A 5 p.c.	—	..	—
255,636	,,	,,	6½	B 3½ p.c.	140—145	..	4 9 8
75,000	,,	,,	5⅜	C 3½ p.c.	113—115	..	4 17 6
79,416	,,	Dec. 28	3	Putney } 3 p.c. Deb. Stk.	79—82	..	3 13 2
779,875	,,	Aug. 15	5⅛	West Ham 5 p.c. Ord.	104—107	..	4 15 9
185,000	,,	,,	5	Do. 5 p.c. Pref.	121—124	+1	4 0 8
193,300	,,	Dec. 28	4	Do. 4 p.c. Deb. Stk.	102—105	..	3 16 2

Prices marked * are "Ex div."

necessary to raise the price of gas by 3½d. per 1000 cubic feet." Mr. Yuill should be thankful to be thus forewarned, because he will have time, between this and April, to mature plans for the overcoming of the dire state of matters foreshadowed.

The appointment of Mr. W. Wilson, of Kirkintilloch, to be Gas Engineer and Manager at Falkirk is a matter upon which he is to be congratulated, and that more particularly when we take into consideration the quality of the other candidates. Of the four who were left in last week, when the matter came to a vote, the first to drop out was Mr. T. Lighbody; the second, Mr. J. Lang; and the final vote was between Mr. J. M'Leod and Mr. Wilson, the latter getting the post by nine votes to five. Mr. Wilson is a most energetic young man; and I suppose the considerations which weighed chiefly in his favour were the varied experiences which he has already had, and the fact of his having been able to reduce the price of gas at Kirkintilloch, in the five years he has been there, by 1s. per 1000 cubic feet. Mr. Wilson is the fourth Gas Manager who has served the Falkirk Corporation since they acquired the undertaking in the beginning of 1895.

Last week I gave some particulars regarding the lighting of the streets of Kirkcaldy, and stated that a report would probably be forthcoming from the Electrical Engineer for the burgh. This report has already been prepared. In it he states that if the average cost per mile of electric arc lighting in the town is five times as much as the average cost of gas lighting per mile, for that extra cost the town is getting twelve times as much light. If, in the opinion of the present Town Council, the quantity of light in the average gas-lighted street is all that is required for lighting the tramway route, then the statement is correct that £700 a year is being thrown away; but it is not correct if a better light is considered necessary. The Engineer quite agrees with the Council of three and four years ago, that the existing arc lighting does not light the principal streets of Kirkcaldy any too well, and that that quantity of light was absolutely essential on the tramway routes for the safety of street traffic and the general public. If this were admitted, then the cost of arc lighting was rather more than twice as cheap as the average gas lighting, light for light.

The paper read by Mr. H. O'Connor, F.R.S.E., before the Royal Scottish Society of Arts in Edinburgh on Monday, upon a new valve for dry gas-meters, which he and Mr. W. Alexander have invented, is one to which attention should be drawn. Its efficiency can, of course, be only tested by use; but, upon the face of the subject, a reduction in the number of directions of travel of gas through a meter, and the making of the directions easier, should effect a considerable improvement in the efficiency of the meter, in, at least, the regularity of delivery, and probably also in accuracy of registration.

The Directors of the Newcastle and Gateshead Gas Company have decided to recommend the payment for the past half year of dividends at the rate of 4 per cent. per annum on the preference stock, and of £4 12s. 6d. per cent. on the ordinary stock.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *Feb.* 2.

Demand has been fairly well sustained, but it has not been sufficient to bring about a further advance in values. Probably severe weather over the greater part of Europe has done something to check buying, though existing contracts have necessarily had to be covered, and prices have been favourable for the operation. The closing quotations are £11 16s. 3d. per ton f.o.b. Hull, £11 18s. 9d. to £12 per ton f.o.b. Liverpool, and £12 to £12 1s. 3d. per ton f.o.b. Leith. For February delivery spot prices would readily be paid, but makers are not concerned to sell beyond prompt delivery unless at a premium. For March-April delivery, there are sellers at £12 5s. to £12 7s. 6d. per ton, according to port; but these prices have not attracted buyers.

Nitrate of Soda.

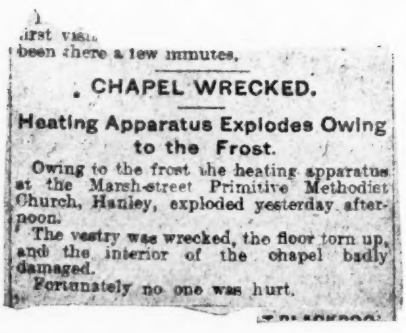
This article is quiet in all positions, and spot prices remain at 11s. 3d. per cwt. for ordinary, and 11s. 9d. for refined quality.

Tar Products. LONDON, *Feb.* 2.

Markets have been steady during the past week. Pitch is firm, though prices are unchanged. Business has been done on the east coast at 24s. 9d. for prompt delivery, and at 25s. to June. On the west coast in Liverpool and Manchester, there is not very much offering, though makers at the former place are reported to be willing to accept 25s. to June, which price, however, has not yet been paid. In South Wales, there does not seem to be any anxiety on the part of consumers to buy; and on the Continent, they appear to be fully bought for delivery this side of June, and will only consider offers for September-March at low figures. Creosote is very firm, though London prices are at a disadvantage compared with other districts. Some quantity of oil was sold for delivery to June at 2⅛d. in bulk at makers' works; while some quantity was sold in barrels over the same period at a price which would leave about the same figure. In the Midlands and the North, oil is difficult to obtain. A fair business has been done in the former district at 2d. to the end of June; but in the latter, 2¼d. is reported to have been offered and refused. Makers' idea of price is 2⅜d. to 2½d.; and they have very little to offer. Solvent naphtha is steady but quiet, and it is possible to buy some quantity upon the east coast at 1s. 1½d.; while in London business could be done to June at 1s. 4d. to 1s. 4¼d. for small quantities. Benzol, 90 per cent., is quiet, and it is improbable that anything over 11½d. could be secured in London—makers being willing to sell at 1s., but unable to get this figure. In the North, business has again been done at prices varying from 10d. to 10¼d. at makers' works. There is little offering in 50-90 per cent., which is steady; nor do buyers appear very anxious to purchase. Carbolic acid remains in the same position. Both English and Continental consumers seem

THIS ACCIDENT

could not have occurred if the Chapel had been heated by Wright's "St. Andrew" Gas-Heated Steam Radiators.


first visit
been there a few minutes.

CHAPEL WRECKED.

Heating Apparatus Explodes Owing to the Frost.

Owing to the frost the heating apparatus at the Marsh-street Primitive Methodist Church, Hanley, exploded yesterday afternoon.

The vestry was wrecked, the floor torn up, and the interior of the chapel badly damaged.

Fortunately no one was hurt.

Do the Churches in your district adopt Wright's Method of Heating? If not, this occurrence might be brought to their notice, to the mutual advantage of all parties.

Wrights the Radiator People.

well bought and not at all anxious for further quantities; and they will not offer anything over the prices which they have already indicated. There is no alteration in the market for crystals. Toluol is steady. Some quantity was sold in the Midlands at equal to 1s. 1½d., casks included, at makers' works for delivery between now and the end of June next. There is nothing of importance doing in anthracene.

The average values during the week were: Tar, 13s. to 17s. Pitch, London, 25s. to 25s. 6d.; east coast, 24s. 6d. to 25s. 6d.; west coast, 24s. to 25s. Benzol, 90 per cent., 10½d. to 11½d.; 50-90 per cent., 11d. to 11½d. Toluol, 1s. 1½d. to 1s. 2d. Crude naphtha, 4¾d. to 5d.; solvent naphtha, 1s. 1½d. to 1s. 4d.; heavy naphtha, 1s. 2d. to 1s. 4d. Creosote, London, 2⅛d. to 2¼d.; North, 2d. to 2⅛d. Heavy oils, 2¼d. to 2 5/16d. Carbolic acid, 60 per cent., 1s. 8½d. to 1s. 8¾d. Naphthalene, £6 to £9 10s.; salts, 35s. to 40s. Anthracene, "A" quality, 1½d. to 1⅝d.

Sulphate of Ammonia.

There has been practically no alteration in the market for this article during the past week, though prices have been well maintained. In some instances, makers have succeeded in selling at the prices quoted by them, and have now raised their limits. Small parcels are being sold in London for immediate delivery at low prices; but there is no change in the figures quoted by the principal London Gas Companies. In Hull, business has been done at £12 for prompt; and it is reported that £12 2s. 6d. has been paid for February-April. In Liverpool, business has been done at £12 1s. 3d., and at much higher figures forward. In Leith, makers report having realized £12 2s. 6d. for some quantity for prompt delivery. There is, however, very little offering in this quarter.

Scott-Snell Lamps for Dock Lighting.—Messrs. Anderson and Duffield, Limited, have secured an order for an additional quantity (between 500 and 600) of improved Scott-Snell lamps from the Mersey Dock Board, for the lighting of all parts of the docks. This is a very valuable order, from a financial point of view; but it is important in another respect, inasmuch as it represents a triumph of gas over electricity, for which the above-named firm and all engaged in the gas industry have reason to congratulate themselves.

A Coroner's Opinion of Water-Slide Chandeliers.—In the course of the inquest on the couple who were found dead from gas suffocation at Ealing, under circumstances recorded in last Tuesday's "JOURNAL," a gas-fitter named Humphries said he had examined the fittings in the house, and found that the water-tube of the chandelier in the downstairs front room was defective. On hearing this, the Coroner (Dr. Gordon Hogg) inquired whether it was "one of those abominable things that required being filled with water." The witness said it was; and in reply to a further inquiry as to whether the escape was due to the tube not being filled with water, he remarked that in all probability the tube was filled the day before, but owing to a defect the water had filtered through. The verdict was "Accidental death."

COAL TRADE REPORTS.

Lancashire Coal Trade.

Last week's prognostications were fulfilled to the letter. The Lancashire Coal Sales Association met at Wigan on Wednesday last, and resolved that the price of all steam and engine coal should be advanced 10d. per ton on and from the 1st inst. The next day, the colliery owners in the Manchester district also held a meeting, and, fortified by the action of the meeting at Wigan, advanced the price of all descriptions of house coal 5d. per ton, with a rise in engine and boiler fuel corresponding to the increase at Wigan. The result has been to put the price of all sections of coal throughout the country on practically the same level. Contract prices, especially with regard to gas coal and cannel, are kept remarkably secret; but there is no doubt whatever that prices for these commodities have risen. The gas coal now being used by the Manchester Corporation costs 1s. 6d. per ton more than the contract price. Quotations on the Manchester Coal Exchange for coal at the pit's mouth, are as follows: Best house coal 14s. 6d. to 15s. 6d. per ton, secondary 13s. 6d. to 14s. 3d., common 10s. to 12s., burgy 8s. 10d. to 9s. 6d., medium 8s. 10d. to 9s. 6d., best slack 8s. to 9s., medium 7s. 6d. to 8s., common 6s. 9d. to 7s., coal for bunkers and export 10s. 6d. to 11s. 6d., furnace coke 17s. to 24s. A 20-feet seam of coal at a depth of over 550 yards has been discovered at Baggeridge Wood, near Wolverhampton, after nearly ten years' sinking operations. The seam is on the estate of Lord Dudley. A general advance of 1s. per ton has been announced on coal in South Yorkshire.

Northern Coal Trade.

With slight interruption, owing to the delay of steamers through the storms, the coal trade has been very brisk; and the tendency of prices has been upwards. The collieries have been working fully, and there is an ample demand for coal of all classes; while for one or two kinds, there is some pressure. Best Northumbrian steams are advanced to from 14s. to 14s. 6d. per ton f.o.b., second-class are from 12s. 6d. to 13s., and steam smalls are a little easier at from 7s. to 7s. 6d.—while for forward delivery, in some cases, higher quotations are made. In the gas coal trade, the demand is a little easier; but this is partly because of the interruption in the arrival of steamers through storms. Apart from this, though the home deliveries are rather less than they were—as usual when February has been entered on—there is more doing in export; and the output is thus well taken up. Prices of gas coals range from about 11s. 6d. to 12s. 9d. per ton f.o.b., according to quality; but even higher figures are spoken of. Some heavy Continental contracts are now in course of negotiation—including those for the Stockholm Gas-Works, taking 115,000 tons of coal, delivered over the season—and the settlement of these in a week or so may do something to define the prices that are likely to rule in the contracts for the year. Coke is firm generally; and gas coke is steady—the reduction

ZANCIG!

M. Zancig: "This?"

Madame: "A photograph."

M. Zancig: "Correct—What of?"

Madame: "Warings' Premises—most up-to-date in London."

M. Zancig: "Yes; how do they heat them?"

Madame: "Ninety-three 'Gas-steam' Radiators, supplied by

RICHMOND'S."

Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.

London Offices and Show-Rooms: 132, Queen Victoria Street, E.C. General Offices and Works: Warrington, &c.

in the output influencing the prices. Good gas coke varies from about 13s. to 14s. per ton f.o.b.

Scotch Coal Trade.

Trade is steady and strong, with prices rising; the Fife coalowners having intimated an advance of 1s. per ton. Ell and splint are in demand for shipping, and supplies are scarce. A large business is being done in steam coal. Washed stuffs and dross are being readily taken up. The prices quoted are: Ell 11s. 3d. to 12s. 9d. per ton f.o.b. Glasgow, splint 12s. to 12s. 3d., and steam 10s. 9d. to 11s. The shipments for the week amounted to 261,206 tons—an increase of 6318 tons upon the preceding week, and of 3866 tons upon the same week of last year. For the year to date, the total shipments have been 785,272 tons—a decrease of 2969 tons upon the corresponding period of 1906.

Surveyors' Evidence.

A discussion on this subject which has been going on for some weeks in the columns of "The Times" has drawn from Sir George Livesey a statement of fact which it will be interesting to reproduce. In the course of a letter, Mr. Humphreys-Davies said "the amount of a valuation depends upon the purpose for which it is made," and "the value of the same thing necessarily varies according to the basis upon, and the purpose for, which it is made." Sir George says he does not know what these statements mean, unless it be that "the amount of a valuation depends upon," or varies with, the question whether it is made for the buyer or the seller. This brings him to his statement of fact, which is as follows: "This Company has in the last 25 years bought a large amount of property, while our sales have been considerable. We found a thoroughly capable and in every way trustworthy Surveyor; and the Directors trusted him. The final purchase under a recent Act of Parliament was completed about two or three months ago. It was the freehold of a town property owned by a great corporation, who were represented by one of the best-known and most highly respected Surveyors. He asked £22,000 or £23,000 for the property; while the Company's Surveyor said it was only worth £15,000. There was no hurry, and as negotiations progressed the figure gradually came down to £20,000, £18,000, and at last to £16,000. When our Surveyor called upon me to confer, he said he still believed that £15,000 was the value, and that by holding out he thought the other side would come down. I told him we left it to him to do what he thought right; and within a month he reported a settlement at £15,500." Sir George makes no comment beyond saying that, had the Company gone to a jury, probably witnesses on one side and the other would have given both higher and lower figures, and the jury would have split the difference.

Opposition to the Mitcham and Wimbledon District Gas Bill.

The Wandsworth Borough Council at a recent meeting resolved to present a petition against the Mitcham and Wimbledon Gas Bill. Last Tuesday, the General Purposes Committee, to whom the matter was referred, reported that they had decided to include the following in the petition to be presented: (1) That the financial provisions of the Bill be opposed. (2) That clause 15 be amended so as to provide that notice as to the sale of stock shall be given to the Council as well as to the Councils of other districts in the Company's area of supply. (3) That the proposed standard price of 3s. 9d. per 1000 cubic feet is too high—the present price charged by the Company being 3s. 6d.; and that the proposed reduction of the illuminating power from 15 to 14 candles should carry a reduction in the price of gas. (4) That clause 30 be opposed with the view of substituting a flat-flame burner for the argand burner for testing illuminating power; that the proposed table photometer be excluded on account of its unreliability; and that local authorities have power to appeal to the Board of Trade to prescribe any other photometer or standard light as well as the Company. (5) That the provision that the Company shall not be liable to any penalty in respect of defects in illuminating power unless the average of three consecutive tests, made at intervals of not less than one hour, be less than the prescribed illuminating power, be objected to, and that a penalty be incurred in respect of one test as at present. (6) That provisions be inserted for testing calorific power and for tests to be made at any time, or with greater elasticity as to times, than as prescribed by the Gas-Works Clauses Act, 1871. (7) That a proviso be added to clause 34 similar to that in the Wandsworth and Putney Gas Act, 1900, that, before laying or relaying pipes in streets not adopted by local authorities, notice be given to the authority, who shall notify the reasonable depth and position where such pipes are to be laid. (8) That clause 40 be amended so that pipes for ancillary purposes may only be laid in the borough with the Council's consent. (9) That the Company be made subject to the provisions of the Acts which regulate and control the Metropolitan Gas Companies.

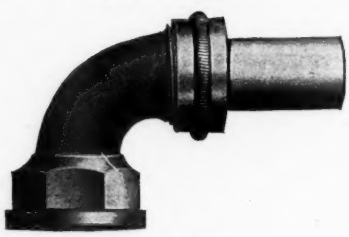
Costly Public Lighting by Electricity.—The following extract from the report of the Local Government Board Auditor on the Long Eaton Urban District Council accounts affords eloquent testimony to the "luxury" of electric lighting: "The cost of public lighting for the year ended March last (1906) appears to be £1367 1s. 5d., of which £1170 10s. 5d. is for electric lighting. For the year ended March 31, 1903, the cost was only £638 4s. 10d., or less than one-half the cost for this year."

Lincoln Water Supply.—At a recent meeting of the Water-Works Committee of the Lincoln City Council, the whole of the circumstances connected with the boring scheme were considered, together with the recommendation of Professor Hull, to which reference has already been made in the "JOURNAL," that the boring at Boultham should be continued to the limit of the sandstone, in the hope that the supply may improve in quality. Mr. Percy Griffith, the Engineer for the scheme, attended the meeting, and addressed the Committee at some length. After a full discussion, it was decided to complete the boring as originally contracted for, by going down an additional 180 feet. This will mean a work of about two months, and the cost will probably be something like £1500.

SAWER & PURVES

Stove Fittings.

STOVE BEND.



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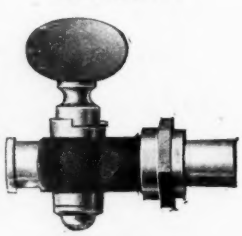
WING HOB TAPS.

No. 114.

STOVE TAP.



No. 110.

SAWER & PURVES,

MANCHESTER & NOTTINGHAM.

Poll on the Hull Gas-Works Purchase.

The poll which was demanded after the ratepayers' meeting (*ante*, p. 168) in connection with the Hull Corporation Bill—which seeks, among other things, power to acquire the works of the East Hull Gas Company—was taken last Wednesday. The various portions of the Bill were voted on separately; and all were carried—though there was only a small majority in favour of the part dealing with the gas-works purchase. The figures were: In favour of acquiring the undertaking, 3143; against, 2427; majority for, 716. As there is a total electorate of 47,284, it will be seen that, even on such an important local question as this, not very much more than one-tenth of those qualified to vote took the trouble to express an opinion one way or the other.

Water Supplies in Flintshire.

Several public authorities in Flintshire are bestirring themselves in the matter of taking advantage of the passing of the Birkenhead Corporation's mains—conveying water to that borough from the Rivers Alwen and Brennig, in Merionethshire—through their districts, to obtain public water supplies. According to the scheme set forth in the Bill, which has been already noticed in our columns, the aqueduct will pass at a distance of about seven miles from Holywell. Both the Rural and Urban Councils are on the alert as to the feasibility of tapping the main, and drawing supplies therefrom. For many years the subject has engaged the attention of the Urban Council, and various schemes have been discussed and abandoned. Close to the town is situated the famous St. Winifred's Well, with its effluent of over 3 million gallons daily. But this spring is several hundred feet below the level of the town, and to deliver the water would involve the construction of new reservoirs and continual pumping. The initial cost of such a scheme has been estimated at £3500, *plus* the cost of pumping. The cost of a pipe-line from the Birkenhead Corporation's proposed main to the town is, of course, a matter of conjecture; but the subject is engaging the consideration of the two Councils, and it is understood that negotiations are pending. The subject is exciting much interest in Flintshire.

Proposed Gas Supply of Belper from Derby.

At the meeting of the Belper Urban District Council last Wednesday, Mr. Smith introduced the question of the price of gas in the town, and moved the following resolution: "That, owing to the high price of gas charged in Belper and district, which in a great measure is no doubt owing to working expenses and other causes arising from the system of dual ownership of works, this Council do at once appoint a Committee, consisting of the whole Council, to take into consideration the advisability of inviting the Derby Gas Company to extend their mains so as to supply Belper; further, that the Council give their support to the Derby Company." Mr. Smith referred to an interview which a deputation from the Town and Trade Association had had with the Directors of the Belper Company, and maintained that the shareholders would not suffer if the Derby Company extended their mains to Belper, while the town would benefit both in regard to the price and quality of the gas. The Chairman (Alderman G. H. Strutt) said he did not offer a word of objection to the proposal. As the owner of a gas-works, he had not found the manufacture of the commodity either fascinating or lucrative. If anyone wished to buy him out on reasonable terms, he should be quite willing to sell. All he wanted to know was whether it would be for the benefit of the town. The resolution to invite the Derby Company was unanimously carried; and the Council were formed into a Committee to go into details.

Walker and Wallsend Gas Company.

The Directors of the Walker and Wallsend Union Gas Company, in their annual report, state that the revenue for the past year amounted to £41,313, and the expenditure to £30,194; leaving a profit balance of £11,119. Adding this to the balance of undivided profits brought forward, there is a sum of £15,120 available for distribution, which the Directors recommend should be appropriated as follows: Interest on mortgages, reserves, &c., £2040; depreciation fund, £500; and insurance fund, £1000. The interim dividends to June 30, 1906, were: Preference stock at 5 per cent. per annum, less income-tax, £285; ordinary 3½ per cent. stock, at £4 17s. 6d. per cent. per annum, less income-tax, £2744; ordinary 5 per cent. stock, at £6 7s. 6d. per cent. per annum, less income-tax, £363. The dividends for the six months to December will be: Preference stock, £285; ordinary 3½ per cent. stock, at £4 17s. 6d. per cent. per annum, less income-tax, £2744. This will make the ordinary 5 per cent. stock, at £6 7s. 6d. per cent. per annum, less income-tax, £666, a total of £10,628, leaving £4492 to be carried forward to next year's account. It is, the Directors remark, very satisfactory to state that the revenue account for the year gives an increase in gross profit, as compared with the previous year, of £2165. There is an increase for 1906 in the sale of gas of 6·35 per cent., and in the number of consumers of 6·71 per cent. The total number of consumers now reaches 10,480. The capital account for the year shows an additional expenditure of £17,942, which has been met by the issue of £10,000 of 5 per cent. ordinary stock, realizing £13,491, or an average of £134 18s. 3·6d. per cent., and £4526 of 4 per cent. mortgage bonds. The general development of the new works at Howdon Lane has been steadily proceeded with. The new three-lift gasholder came into use in November, and is proving of great advantage. The excavations, foundations, sidings, &c., are being rapidly carried out. The Directors are giving careful consideration to the buildings and manufacturing plant; and to meet the additional outlay a special meeting will be held at the close of the ordinary meeting next week to authorize the raising of further capital. The Gas Companies (Removal of Sulphur Restrictions) Act, 1906, received the Royal Assent on July 20; but the Directors have not as yet altered their mode of purification, owing to limited space.

THE "BLAND" LIGHT IN CHURCH.

ACTUAL FACTS

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4th Jany 1907

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The Saving on this quarter alone has been 33,400 ft. to the value of £6. 13. 7.

Xmas Qr. 1905
Naked Burners 65,200

Xmas Qr. 1906
Bland Light 31,800

33,400.

During the whole of this past quarter we have not renewed a single mantle or globe.

Yours faithfully
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Churchwarden Ross Parish Church

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Bude Gas Bill.—The Stratton and Bude Urban District Council, at their last meeting, had under consideration a report by the General Purposes Committee on the Bill which is being promoted for the supply of the district with gas. The Committee instructed the Clerk to write to the Parliamentary Agents (Messrs. Baker and Co.) to ascertain the names of the promoters, the amount of the capital, and other particulars with regard to the proposed undertaking. He was also instructed to ask whether provision could be made giving the Council the option of purchasing the undertaking at the end of twenty years, on the basis of the profits of the preceding five years, as determined by arbitration. Inquiry was also made as to the question of street lighting and the establishing of a testing-station if the Council should wish to have one. The Council have since held a private meeting to consider the reply of Messrs. Baker and Co.

Cushendall (Co. Antrim) Water Supply.—Mr. A. D. Price, one of the Inspectors of the Local Government Board for Ireland, recently held an inquiry into an application by the Ballycastle Rural District Council for sanction to a loan of £1928 for providing a water supply for Cushendall. Dr. M'Larnen, formerly Medical Officer of Health for the village, gave evidence as to the supply of water being only two wells, both of which were totally unfit to be used for drinking and domestic purposes. Mr. T. J. O'Neill stated that he had been instructed by the Council to prepare plans for the water and sewerage scheme for the village. There was no chance of contamination. Objection was raised to the scheme on the ground of its being too expensive for the place; but it was stated by the Clerk to the Council that it would entail a rate of only 3d. or 4d. in the pound.

Dissatisfaction with Electric Lighting at Acton.—In the course of a Local Government Board inquiry, conducted by Mr. H. R. Hooper, M.Inst.C.E., held on Friday at the offices of the Acton Urban District Council, into the application of the Council to borrow an additional £20,000 for the purposes of their electric light undertaking, Mr. A. V. Palmer, the Hon. Secretary of the Acton Ratepayers' Association, said this body had from the very first been against the Council purchasing electricity in bulk. Their agreement with the Metropolitan Electric Supply Company, Limited, was such that the scheme could never be made a financial success. As to the scheme itself, it was known locally as "the light that failed;" and the ratepayers regarded it as a scandalous waste of public money to have substituted such a poor light in the main road for incandescent gas lighting, which was far superior.

Hartwell Water Supply.—Last Wednesday, the village of Hartwell, which is within the jurisdiction of the Potterspury (Stony Stratford) Rural District Council, was furnished with a water supply, at a cost of about £1100. Two springs were known to exist about a mile from the village, and by means of the divining-rod their course was traced by Mr. J. B. Fairchild, the Surveyor to the Council, until a spot was reached just above where they met. Here a well was sunk to a depth of 33 ft. 8 in., and a plentiful supply tapped in the dry season. After the well had been pumped continuously for fourteen days (6000 gallons per hour being yielded), a wind-engine capable of raising 400 gallons every hour to a height of 150 feet was erected on steel towers 30 feet high, and the water pumped to receiving-tanks just above the village. Their storage capacity is 15,000 gallons, and allowing six gallons per head per day, and taking the population at 400, the tanks when full will hold six days' supply. From the tanks, the water flows by gravitation into ten stand-pipes distributed through the village. The works, which were commenced last October, were designed by Messrs. W. J. Treadwell and Son, of Middleton Cheney.

Improved Relations at Sidmouth.—Presiding at the annual meeting of the Sidmouth Gas Company, Mr. Thomas Douglas, the Managing Director, pointed out that the past year had been very successful, and the increase in the consumption of gas continued in a satisfactory degree. The dividends paid for the year were 7½ per cent. on the preference shares and 10 per cent. on the ordinary shares; and there was a balance of £1258 to carry forward. Under the agreement which had been entered into with the District Council, the Company would carry out the public lighting for a term of five years. Many of the lamps would be fitted with incandescent burners; and the arrangements would, he thought, be found satisfactory to the Council and to the Company. The works were in an improved condition, and the new regenerator furnaces were a source of economy. The leakage was still too much; and though some means had been adopted to reduce it, there was not much prospect of success in this direction so long as the Council used the present heavy steam-roller. Dr. Pullin congratulated the Chairman on the termination of the controversy which had disturbed the relations between the Company and the Council. He considered the new lights already put up, under the agreement with the Council, were a great improvement. The report was adopted.

The Water-Finder's Gift.—At a recent meeting of the London Spiritualists' Alliance, Professor W. F. Barrett, of Dublin, whose name will be remembered by many of our readers in connection with his investigations into the nature of the water-finder's power of divination, delivered an address on the subject. He said "dowsers" were to be found in all ranks of society, and though they were very well known in the south-west of England, they were not confined to that part of the country. They were known throughout the whole of the civilized world. In Somersetshire, a property owner would as soon think of planting a tree with its roots upwards as of sinking a well without employing a diviner. Frequently these people were of the labouring class, ignorant of all science; but the President of the Cornish Geological Society was a dowser. Lord Farrar, again, was a capital one, as also was Mr. Andrew Lang. Dean Ovenden had discovered, to his amazement, that he, too, was a water-finder. Children had the dowsing power, and women as well as men, girls as well as boys, possessed it. Electricity had nothing to do with the phenomenon, he was certain; nor had any radio-active power. The cause was not a physical one—it was psychical. What was it, then? It was an instinct, or gift—a sort of clairvoyance. A dowser was a person who, unconsciously to himself, was able to perceive the presence, not only of underground water, but of anything that he was set to work to seek, such as a buried treasure or a mineral lode; and, as he had proved, the sensitiveness of the dowser was stronger when the subject was hypnotized.

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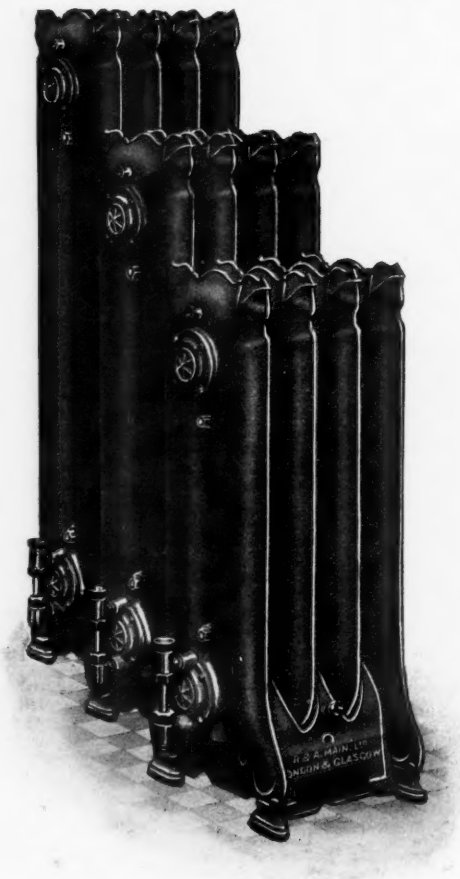

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Mr. W. A. Schultz, F.C.A., the Secretary of the Ascot District Gas and Electricity Company, and Director of other Gas Companies, has been appointed a Justice of the Peace for the County of London.

The Holmfirth Urban District Council have appointed a deputation to meet the Directors of the local Gas Company for the purpose of discussing with them the subject of the sale of the undertaking to the Council. The Directors were asked to name a time for the meeting.

The Pembroke district of Dublin suffered some inconvenience owing to the break in two places of a 24-inch water-main while under test. The tram-lines were flooded, and pedestrians were naturally put to some trouble. However, the authorities were soon communicated with, and the water turned off.

The Derby Gas Company, on the recommendation of their Engineer (Mr. J. Ferguson Bell), have placed a contract for six settings of eight through retorts each, on the deep regenerative principle, with Messrs. F. C. Sugden and Co., of Leeds. The regenerators are to be fitted with Hudson's patent producers.

The Gas Committee of the Coventry City Council have resolved to make a grant of £200 to Mrs. Howarth, the widow of the man killed in the accident at the gas-works last July—provided that this £200 is added to the £300 which Mrs. Howarth has received from the Insurance Company, and the joint amount placed in trust for the benefit of her and her children, under a trust deed.

Last Wednesday morning, the 36-inch water-main of the Liverpool Corporation burst at Huyton. The force of the water carried away a large quantity of the roadway and swept away the footpath for some distance, depositing it on to the road and completely blocking the tramway track. A number of Corporation workmen were soon on the scene removing the *debris* and repairing the damage.

By an announcement which appears elsewhere, our readers will see that the Directors of the Norwich Water Company are inviting tenders for 500 ordinary £10 shares, at a minimum price of £16 5s. each—being part of the capital authorized by the Company's Act of 1904. The shares will be issued as fully paid, and be entitled to a maximum dividend of 6 per cent. Tenders are to be sent in by the 22nd prox., and the dividend will accrue from the 6th of April.

From an announcement which appears elsewhere, our readers will see that the Saxmundham Gas Company, Limited, are issuing 3500 cumulative preference shares of £1 each, entitling the holders to a dividend at the rate of 5 per cent. per annum from the date of payment. The Company has been formed, with a capital of £5000, to acquire the undertaking of the Saxmundham Gaslight, Coal, and Coke Company as a going concern, and the vendors will take the 1500 ordinary shares in part payment of the purchase money.

While two men from the Nottingham Gas Department were examining the meter and fittings at a house from which a complaint of an escape had been received, there was a violent explosion; but fortunately the men, and the inmates of the house, were not injured. A staff of men from the gas-works were quickly on the scene; and it was ascertained that the cause of the accident was a leakage in the main in the street—the gas having found its way by the service-pipe into the house and accumulated under the floors, thus causing the explosion when a match was struck.

The Directors of the National Gas-Engine Company, Limited, in their report for the past year state that the net profit, after deducting ample depreciation on buildings, tools, &c., and allowing for trade expenses and management salaries, is £46,143. After providing dividends on the preference shares and adding £5067 brought forward from last year, they propose to pay a final dividend at the rate of 20 per cent. per annum on the ordinary shares (making 20 per cent. for the year), leaving £20,674, out of which it is proposed to place £10,000 to the reserve fund (making it £70,000) and carry forward £10,674.

The Stirling Gas Company have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for a new retort-bench, consisting of ten settings of eight retorts, on the regenerator system, complete with all foundations, subway floor, retort-mountings, foul main, governors, tar-towers, and Everitt's patent tar-extractor. The contract also includes complete coal-handling plant, with breaker, elevator, conveyor, and continuous overhead hoppers, and one of Messrs. Robert Dempster and Sons' combined charging and discharging machines, similar to the one inspected by Mr. J. D. Smith, the Gas Company's Engineer, at the Bingley Gas-Works. The whole of the work has to be carried out under the supervision of Mr. Smith.

The outdoor staff of the British Gaslight Company, Limited, at Norwich, last Friday week sat down (to the number of about 130) to a dinner which it is hoped to make an annual affair. In the absence through indisposition of Mr. Thomas Glover, the chair was occupied by Mr. W. H. Wayte, the Outdoor Superintendent. Proposing the toast of "The British Gaslight Company," Mr. F. Balls, the Chief Collector, spoke of the progress of the undertaking during the thirty years he had been connected with it. He said that thirty years ago the street lighting was poor; and lamplighters had to carry ladders and matches in order to fulfil their duties. Now the public lighting of Norwich was second to that of no other town—thanks to the introduction of incandescent mantles. Thirty years ago the fitters in the employ of the Company could be counted on the fingers of one hand; now they numbered sixty. In his period of service, gas cooking-stoves had been introduced; and now there were 18,000 in use in Norwich. Then slot-meters had been introduced within the last twelve years; and to-day there were something like 18,000 in the city—more than in any other town of the same size. All these changes and improvements had been effected by the former Manager, Mr. John Young, and the present one, Mr. Thomas Glover, assisted during the last three years by the Chairman that evening. Mr. V. Harston responded, and remarked that he had been told the British Gaslight Company were the only gas company who had ever been thanked by a corporation for the way they lighted the streets. The Company were very good people to work for. They gave the men every encouragement to take an interest in the business, and looked after the welfare of their employees.

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CREDITON GAS COMPANY. Feb. 22.
NORWICH WATER COMPANY. March 22.
SAXMUNDHAM GAS COMPANY. Feb. 9.
SUNDERLAND AND SOUTH SHIELDS WATER COMPANY. Feb. 21.

Company Meetings.

BARNET GAS AND WATER COMPANY. Albion Tavern. Feb. 22. 12.30 o'clock.
BRENTFORD GAS COMPANY. Westminster Palace Hotel. Feb. 15. 2.30 o'clock.
BROMLEY GAS COMPANY. Bell Hotel, Bromley. Feb. 19. Six o'clock.
MITCHAM AND WIMBLEDON GAS COMPANY. Offices. Feb. 26. Three o'clock.
RIDDINGS DISTRICT GAS COMPANY. London Office. Feb. 22. Three o'clock.
SOUTH SUBURBAN GAS COMPANY. Albion Tavern. Feb. 22. Three o'clock.
TOTTENHAM AND EDMONTON GAS COMPANY. Offices. Feb. 23. Three o'clock.
WEST HAM GAS COMPANY. Liverpool Street Hotel. Feb. 25. 12.30 o'clock.

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CONGLETON GAS DEPARTMENT. Tenders by Feb. 9.

Burners, Mantles, Lanterns, Pendants, &c.

NEWTON-IN-MAKERFIELD URBAN DISTRICT COUNCIL. Tenders by March 2.

Coal.

BEDALE GAS COMPANY. Tenders by Feb. 16.

Cookers.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 19.

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BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 19.
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Gasholder (Telescoping).

COCKERMOUTH GAS DEPARTMENT. Tenders by Feb. 18.

Gasholder.

DUNEDIN (N.Z.) CORPORATION. Tenders by June 19.

General Stores, Lead, Ironmongery, &c., &c.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 19.
NEWTON-IN-MAKERFIELD URBAN DISTRICT COUNCIL. Tenders by March 2.

Governors.

CONGLETON GAS DEPARTMENT. Tenders by Feb. 9.

Iron and Steel Work (Wrought and Cast), &c.

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NEWTON-IN-MAKERFIELD URBAN DISTRICT COUNCIL. Tenders by March 2.

Lime and Cement.

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NEWTON-IN-MAKERFIELD URBAN DISTRICT COUNCIL. Tenders by March 2.
SALFORD GAS DEPARTMENT. Tenders by Feb. 14.

Logs.

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Meters (Gas, Water, and Station).

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 19.
CONGLETON GAS DEPARTMENT. Tenders by Feb. 9.
NEWTON-IN-MAKERFIELD URBAN DISTRICT COUNCIL. Tenders by March 2.

Oil.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 19.
NEWTON-IN-MAKERFIELD URBAN DISTRICT COUNCIL. Tenders by March 2.

Oxide of Iron (New and Spent).

NEWTON-IN-MAKERFIELD URBAN DISTRICT COUNCIL. Tenders by March 2.
POWELL DUFFRYN STEAM COAL COMPANY.

Pipes and Specials, Steam Tubes, &c.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 19.
BARRY URBAN DISTRICT COUNCIL. Tenders by Feb. 21.
CONGLETON GAS DEPARTMENT. Tenders by Feb. 9.
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Pump.

ISLE OF THANET GAS COMPANY. Tenders by Feb. 7.

Purifiers and Roof.

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Sulphuric Acid.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 19.
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Tar and Liquor.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 19.
HERNE BAY GAS COMPANY. Tenders by Feb. 11.
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Valves, Cocks, Fittings, &c.

BARROW-IN-FURNESS CORPORATION. Tenders by Feb. 19.
CONGLETON GAS DEPARTMENT. Tenders by Feb. 9.
NEWTON-IN-MAKERFIELD URBAN DISTRICT COUNCIL. Tenders by March 2.

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